Development of a management tool for value creation supported by information systems in healthcare: an ecosystem perspective

by

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DECLARATION

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ABSTRACT

South Africa's healthcare sector has faced numerous challenges, that still persist today, that are rooted in policies that existed during the colonial and apartheid era. The current challenges that exist include: access to healthcare, the increase in noncommunicable diseases, and an increase in infant mortality. Despite the many breakthroughs achieved through innovations established post-1994, their success has been restricted due to the failure to fully delegate authority and by the erosion of efficiencies due to lack of leadership, corruption, and low staff morale. The persistence of these challenges presents the need to develop health-related solutions that have the potential to improve performance and accountability by establishing goals that unite the interests of all stakeholders. The goal that formed the focus of the research study was that of value. The research was used an opportunity to introduce the central challenge of value creation supported by information systems. The research focused on the factors that contribute to the ineffective management and use of information and how that affects the value that is created in a healthcare system.

The healthcare industry in comparison to other industries is lagging in the adoption of formal strategies for information systems planning. This is partly owed to the complexity of the healthcare system. The research was specifically used to understand the role of information systems in healthcare and to explore various co-creation practices that could be used in conjunction with information systems to generate value. The research highlights the importance of value co-creation in the success of health information systems in addition to the crucial issue of strategic planning. The various value co-creation practices that were investigated in the research provided an anchor for the more abstract concepts of the value creation phenomena in order to strengthen their explanatory power in the healthcare context.

A grounded theory approach was followed in the research to develop a novel management tool that takes on a macro level focus in healthcare. The proposed management tool consists of three overarching dimensions that characterises important strategic features of a value creation system that may be considered in healthcare. The research uses the term "value creation system" throughout the study, as it considers the value creation process to be one that is complex and consisting of entities that are part of an interconnected network. The research explores these connections and how they can be used to create a conducive environment for value creation. It achieves this by adopting an ecosystem perspective that transcend the internal view of the healthcare system. This perspective offers a holistic view of the healthcare system and its networks, relationships and mechanisms that shape it, all while still taking into account the roles and strategies within the healthcare system. The dimensions of the framework are intended to assist researchers, policymakers, and health care workers to understand how a value creation system, supported by information systems, can be used to address and possibly overcome challenges faced within a healthcare organisation.

OPSOMMING

Die gesondheidsorgsektor in Suid-Afrika kom voor talle uitdagings te staan, wat vandag nog voortduur, wat onstaan het uit beleidsrigtings gedurende die koloniale en apartheidsera. Huidige uitdagings sluit in: toegang tot gesondheidsorg, die toename in nie-oordraagbare siektes en 'n toename in kindersterfte. Ondanks vele deurbrake deur middel van innovasies sedert 1994, is die sukses daarvan beperk as gevolg van die versuim om gesag ten volle te delegeer te midde verswakking van doeltreffendheid weens gebrek aan leierskap, korrupsie en lae moraal van personeel. Die uitdagings bied die noodsaaklikheid om gesondheidsverwante oplossings te ontwikkel wat die potensiaal het om prestasie en aanspreeklikheid te verbeter deur doelwitte van alle belanghebbendes in ag neem.

Die het die skepping van waarde in gesondheidsorg-programme bestudeer Die navorsing het gefokus op die faktore wat bydra tot die oneffektiewe bestuur en gebruik van inligting en hoe dit die waarde wat in 'n gesondheidsorgstelsel geskep word, beïnvloed.

Die navorsing beklemtoon die belangrikheid van waardeskepping in die sukses van gesondheidsinligtingstelsels, benewens die essensiële kwessie van strategiese beplanning. Die verskillende waardeskeppingspraktyke wat in die navorsing ondersoek is, lê die grondslag vir die abstrakte konsepte van waardeskeppingsverskynsels en hul verklarende krag in die gesondheidsorgkonteks.

'n Gebaseerde teorie-benadering is gevolg in die navorsing ten einde 'n innoverende bestuursinstrument te ontwikkel wat fokus op die makrovlak in gesondheidsorg. Die voorgestelde bestuurshulpmiddel bestaan uit drie oorkoepelende strategiesdimensies van ‘n waardeskeppingsisteem. Die navorsing gebruik die term "waardeskeppingsisteem" gedurende die hele studie, aangesien dit die waardeskeppingsproses beskou as een wat kompleks is en bestaan uit entiteite wat deel uitmaak van 'n onderling gekoppelde netwerk. Die navorsing ondersoek hierdie verbindings en hoe dit gebruik kan word om 'n bevorderlike omgewing vir waardeskepping te skep. Dit word bereik deur die ekosisteemperspektief ten einde 'n holistiese benadering te verkry van die gesondheidsorgstelsel, sy netwerke, verhoudings en meganismes wat dit vorm, terwyl dit steeds die rolle en strategieë binne die gesondheidsorgstelsel in ag neem. Die dimensies van die raamwerk stel ten doel om navorsers, beleidmakers en gesondheidswerkers te help om te verstaan hoe 'n waardeskeppingsisteem, ondersteun deur inligtingstelsels, gebruik kan word om uitdagings wat 'n gesondheidsorganisasie in die gesig staar, aan te spreek en moontlik te oorkom.

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LIST OF ACRONYMS AND ABBREVIATIONS

ANC	The African National Congress
BR	Boundary Requirements
CFA	Conceptual Framework Analysis
DART	Dialogue, Access, Risk assessment, Transparency
EMR	Electronic Medical Record
FHIR	Fast Healthcare Interoperability Resources
FMT	Frameworks, Models, Tools
FR	Functional Requirements
HL7	Health Level Seven
HIV	Human Immunodeficiency Virus
IC	Input Category
IT	Information Technology
ICT	Information and Communications Technology
NDoH	National Department of Health
NHI	National Health Insurance
OC	Output Category
REC	Research and Ethics Committee
RO	Research objective
SA	South Africa
SPA	Strategic priorities and Activities
SR	Structural Requirements
SSA	Sub-Saharan Africa
TB	Tuberculosis
UR	User Requirements
VC Aim	Value Creation Aim
WHO	World Health Organisation

Chapter 1: **Introduction**

Chapter 1 introduces the research study by providing a background on the problem landscape which serves as a motivation for the study. This background leads to the emergence of the research problem, which is translated into the research questions and objectives. The research scope and limitations are discussed along with the ethical implications of the research study. This is followed by an overview of the document structure which concludes the chapter.

Chapter 1 objectives:

- Provide background information regarding the project origin
- Define the research problem clearly
- State the research questions and objectives
- Discuss the research delimitations and limitations
- Provide a brief overview of the research design approach and methodology
- Discuss the ethical implications of the research
- Present an outline of the research study structure

1.1 Background

The emergence of healthcare as an important research area has contributed to the role of healthcare in the critical social and economic development of modern economies [1]. While cost of healthcare contributes to a substantial portion of the gross domestic product, the health of the population yields economic dividends as healthy people are more productive and able to contribute to the country's economic growth [1], [2] . It is estimated that a 10% increase in life expectancy at birth corresponds to a rise of 0.4% in economic growth per year. Therefore, investing in healthcare translates into additional income per year which in turn can be used to improve living conditions and social infrastructures in poorer areas [2]. Conversely, prevailing social, political and economic concerns within the healthcare industry are resulting in pressure to control costs. To deal with this pressing issue, attention is placed on management practices in the healthcare sector in order to manage costs while still improving the quality of care and making healthcare safer, affordable and accessible. Information systems in particular are considered as a key investment area to address these rising challenges, and have become fundamental in the delivery of healthcare. Information systems are able to improve the coordination of healthcare both at the individual and population level by capturing, storing, processing and communicating timely information to decision makers. However, despite the potential benefits that can be delivered by information systems in healthcare, there are challenges faced by healthcare organisations to get the most value from their investments in information systems [1]. These challenges arise from the complexities that come with information systems as they represent the "patient", which is considered to be a complex idea of a person [3], [4].

1.1.1 Historical root of the current the healthcare system in South Africa

South Africa's (SA) history of discrimination of individuals based on race and gender has profoundly affected health polices and healthcare services today [5]. Dysfunctional healthcare systems are rooted in policies that existed during the colonial era, apartheid era and the post-apartheid period. The distinctive features of these periods that account for the current healthcare problems include: racial and gender discrimination, income inequalities, migrant labor, destruction of family life, and persistent violence that spans many centuries. The post-apartheid model for the improvement of healthcare systems was a health plan established by The African National Congress (ANC). This

plan was published in 1994 and aimed to address the disempowerment, discrimination and underdevelopment that weakened the healthcare system [5]. Through this plan, the public healthcare system was made the cornerstone of health policy. This transformed the healthcare system into an integrated and comprehensive national service that would allow all people, including those who were previously disadvantaged, access to essential healthcare [5]. Despite the government's efforts to strengthen the healthcare system, healthcare in South Africa is still grappling with massive healthcare inequalities, despite the constitutional obligation to the right to access to healthcare services [5], [6]. These inequalities give rise to three additional layers to this "access" that need to be considered. These layers include availability, affordability and acceptability. Availability considers whether the appropriate healthcare services are available at the right place and right time. Affordability considers the cost of using healthcare services and an individual's ability to pay. Acceptability considers the cultural aspect between the provider and the patient which plays a role in the attitude and expectations that each one has on the other [7].

A clinic infrastructure program was established to improve the availability and access to health-care services in the 1990s. This program resulted in 1 345 new clinics built and 263 clinics upgraded [5]. There have also been efforts to renovate and build new clinics through a comprehensive facility audit in 2011 to 2012 [7]. Further initiatives to improve access to health include: the formulation and passing of legislations to strengthen the health sector; the development of a vital drugs list; the redistribution of resources between geographical areas and the development of standard treatment guidelines developed for both primary healthcare and hospital levels [5].

There are distinct differences in the rate of disease and mortality between races and provinces, as can be seen in Figure 1.1. This is reflective of the varying access to basic determinants of health that differ between races. An example of this can be seen in national estimates for the Human Immunodeficiency Virus (HIV) that show that white and Indian people have a relatively low prevalence of disease, with 0.6% and 1.9% respectively. However, in the black population these estimates are at a staggering 13.3% [5]. Infant mortality also varies between different racial groups, where in 2005 it was estimated that the infant mortality rate varied between 18 per 1000 people in the white population and 74 per 1000 people in the black population. These results are similar to those persisting in the early 1990s [8]. Substantial inequalities in health also exist provincially with the mortality rate for children under the age of 5 ranging from 46 per 1000 livebirths in the Western Cape to 116 per 1000 livebirths in KwaZulu-Natal. There are also differences between the metropolitan areas of the respective provinces with almost a threefold difference in infant mortality rates between middle-class areas and informal settlements [5].These disparities are just the tip of the iceberg of the dysfunction that exists within South Africa's healthcare system and are not conducive for sustainable development [8].

The Ministry of Health provides overall guidance on activities conducted in healthcare to improve the level of health in South Africa. The development of the National Health Insurance (NHI) is one such activity that has taken place to ensure that everyone has access to appropriate, efficient and quality healthcare services. The NHI proposes four key interventions which include: 1) the transformation of the healthcare delivery and provision; 2) the complete overhaul of the healthcare system; 3) change in administration and management within the healthcare system; and 4) the provision of comprehensive care that is underpinned by reengineered Primary Health Care [9].

Despite the many breakthroughs achieved through innovations established post-1994, their success has been restricted by the failure to fully delegate authority and by the erosion of efficiencies due to lack of leadership, corruption and low staff morale [10]. This loss in momentum can also be owed to financial constraints that are present in the public healthcare system. Inadequate financial levels

inherently prevent the public healthcare system from being sustained and/or improved. For this reason, the South African healthcare system is considered to be on the edge of a chasm that has the potential to be bridged by new resources and decisive leadership which can demonstrate rapid improvements of quality of care and service delivery [10].

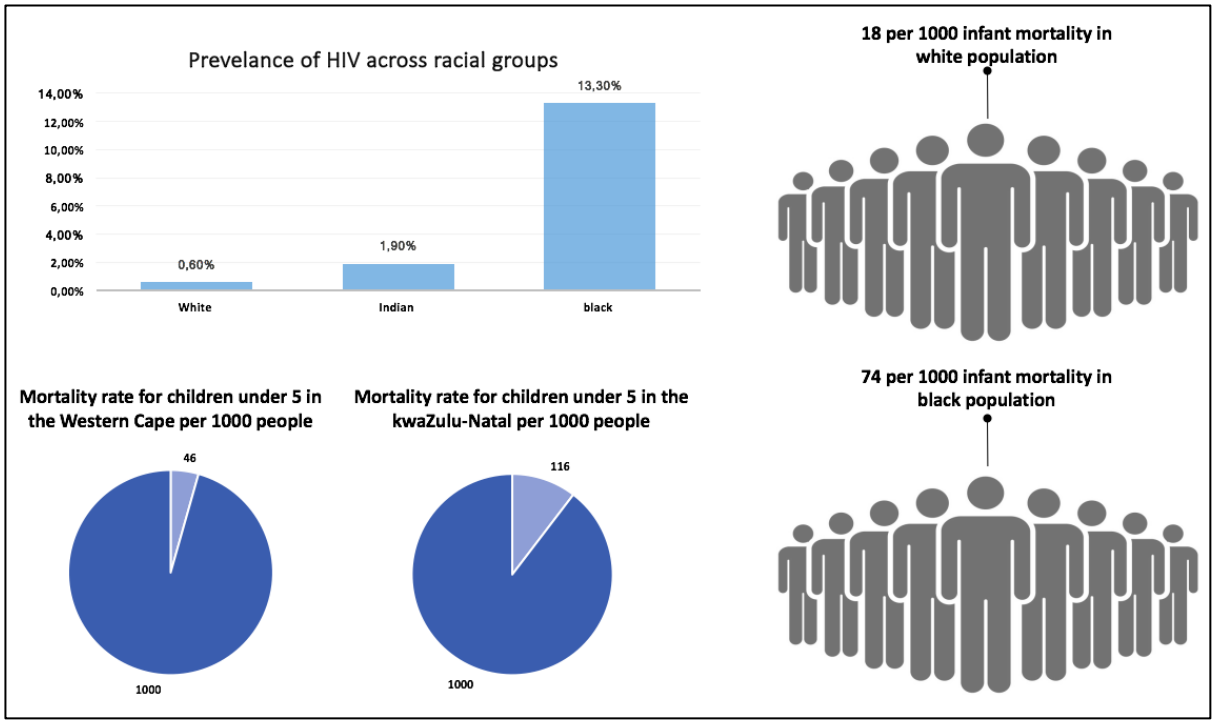


Figure 1.1: Rate of disease and mortality between races and provinces [5],[8]

1.1.2 Value in healthcare ecosystems

Improving performance and accountability in any field is dependent on establishing goals that unite the interests of all stakeholders. In most fields, this goal is to create value. The concept of value refers to the difference between achieved outputs and the incurred cost. Defining and measuring value is an essential prerequisite that is needed to gain a full understanding of the performance of any organisation and to drive continuous improvement [11]. In healthcare, value is defined as the achieved patient outcomes relative to the cost spent. Value encompasses and integrates many of the already existing goals in a healthcare system which include quality, safety, patient centricity and cost management [11], [12]. These goals unite the interests of actors such as patients, payers, providers and suppliers [11], [13]. Value should therefore be a preeminent goal in a healthcare system as these actors all benefit from the improvement of value and economic sustainability [11].

Making value a central focus in healthcare is still a persisting challenge despite its overarching significance [11]. This, together with value still remaining largely unmeasured, has hobbled innovation and is arguably one of the principal reasons why transformation in healthcare has been difficult compared to other fields [11]. In healthcare, traditional organisational divisions need to be broken down to enable different healthcare workers to complement one another through the use of interventions. This is essential for the development of sustainable healthcare systems where value arises from the integration of various interventions within different treatment areas [14], [15]. Working in this way essentially enables collaborative environments to form which is favorable for delivering high-value care for patients [15].

Although patients and customers are said to differ in literature, the traditional view of the customer is one that is prevalent in healthcare. This view considers customers to be passive recipients that are separate and outside of the firm. Fields such as service-dominant logic and consumer culture

theory, have shifted from this traditional view of the customer by developing a different model that views the customer as an active, rather than passive participant [13]. This emerging view encourages public engagement by integrating the customer into the value creation process where they can co-create value with the firm and other customers [13]. This idea of public engagement is increasingly becoming embedded within national and international policies as it assists decision makers in identifying and understanding the needs of those affected by their decisions and actions. These people, termed stakeholders, have the power to influence the outcomes made by decision makers. For this reason, the analysis of stakeholders has become popular within a wide range of organisations in varying fields [16]. This new understanding of the customer challenges the way in which healthcare service providers currently view their patients and how they should view them [13]. This new model needs to be considered to ensure that the solutions developed within the healthcare system are of value to the patients [17].

1.2 Research problem statement

The World Health Assembly 2018 recognized digital technology as having the potential to advance the Sustainable Development Goals, and in particular to support healthcare systems by improving accessibility, quality and affordability of health services [18]. Digital health technology offers an opportunity to reinforce the healthcare system by transforming how health services are provided and the way in which people engage with those services. Despite the benefits of digital health technology, creating value for money from procured and implemented information systems remains a strategic challenge facing Digital Health due to fragmented and poorly coordinated systems [18]. The healthcare industry in comparison to other industries is lagging in the adoption of formal strategies for information systems planning. This is partly owed to the complexity of the healthcare system. While information systems in the healthcare industry are largely dependent on the consideration of the healthcare organisation's objectives and strategies during the planning process, its success is not guaranteed. Therefore, in addition to recognizing the crucial issue of strategic planning to increase the likely success of information systems in healthcare, it is also imperative to elucidate the impact of value co-creation in the success of health information systems [4], [19].

Value co-creation is the process in which value is generated through interactions occurring between multiple stakeholder groups within an ecosystem [20], [21]. Exploring value co-creation within these ecosystems is essential for the improvement of healthcare services [20]. Ecosystems, is the business and/or service sense, are a metaphorical approach used to analyse dynamic and massively interconnected organisations, technologies, and actors through a holistic and multi-actor lens [22]. Ecosystems are therefore used to symbolize a system that is composed of resource integrating actors that are connected through service exchanges at multiple levels [23]. The involvement of multiple stakeholders in the ecosystem has a key role in the co-creation of value between stakeholders. Lack of attention and recognition of the role that multiple stakeholders have within such an ecosystem can result in structures and initiatives becoming increasingly irrelevant [20]. It is therefore important to understand multiple stakeholder ecosystems through a systems approach that enables a holistic view of all the parts of the system at different levels [24]. Furthermore, focus should be placed on the whole complex ecosystem to gain a deeper understanding of where and how value emerges from the collaboration of ecosystem actors.

Before the COVID-19 global pandemic, major progress had been made in the improvement of people's health [25]. Improving the health of a population and promoting its well-being is crucial for sustainable development [26]. Health emergencies such as COVID-19, have shown the importance of investing in innovation and infrastructure progress to enable the development of new resilient technologies and efficient use of resources [25]. Figure 1.2 illustrates how the research aims to contribute to the Sustainable Development Goals, where the successful implementation of such a healthcare innovation could potentially contribute to better health and well-being of a population.

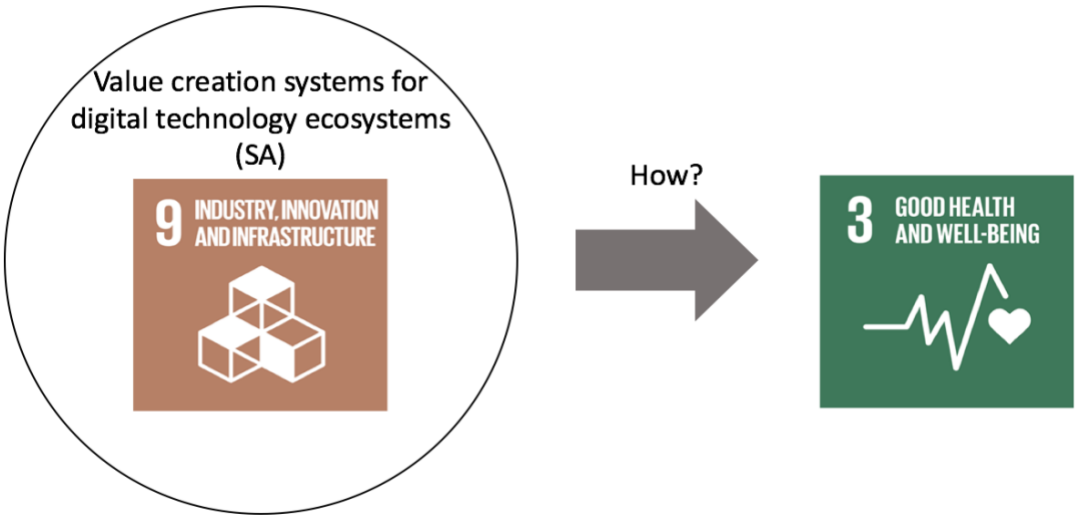


Figure 1.2: Research contribution to SDGs

The strategic challenges of creating value through information systems motivates for a novel management tool that ensures long lasting economic and environmental sustainability within a multi-stakeholder healthcare ecosystem. This can be achieved through the consideration of the roles, mechanisms and the individual actors that form part of the healthcare system.

1.3 Aim and importance of research

The research aimed to provide a strategy that could be used in healthcare to improve the delivery of healthcare services. The research also had three underlying aims that further guided the research in addition to the overarching aim. First, the purpose was to investigate unique and interdependent factors of value from an ecosystem perspective. The research uses the term “value creation system” throughout the study, as it considers the value creation process to be one that is complex and consisting of entities that are part of an interconnected network. The research aimed to explore these connections and how they can be used to create a conducive environment for value creation. The second purpose of the research was to introduce the central challenge of value creation that is supported by information systems. Here, the focus was on the factors that contribute to the ineffective management and use of information and how that affects the value that is created in healthcare. Healthcare delivery comprises various organisational units that include hospitals, physician practices and units providing single services. However, none of these reflect clear boundaries within which value is created [11]. The third purpose of the research was to explore value co-creation empirically by investigating approaches and activities involved in ‘value’ ‘co’ and ‘creation’. Here, emphasis was placed on ecosystem actors who interact through mutual exchange and how value emerges from their collaboration. Achieving high value for all stakeholders needs to be an overarching goal for healthcare delivery. This will result in the satisfaction of all stakeholders involved and will ultimately improve the performance of the healthcare system.

There are numerous challenges that affect a healthcare system’s ability to deliver value to its stakeholders in an efficient and effective manner. The research was used as an opportunity to gain an in-depth understanding of these challenges. Furthermore, the research was used to understand the role of information systems in organisations and to explore various co-creation practices that can be used in conjunction with information systems to generate value. The research has the potential to support economic development and human well-being in the South African health context. The potential benefits of the research span across different types of healthcare systems.

1.4 Research questions and objectives

The formulation of the research questions and objectives was grounded in the background of the research study and the research problem. The research questions formed the specific concern that the research intended to address and hence guided the development of the research study. The research questions were grouped into three parts which included: the main research questions, the sub-questions and the additional sub-questions to guide the formulation of the literature reviews. The research objectives (RO) formed the specific actions that would take place to during the development of the study in order to complete the research and hence answer the research questions. The research study was executed in two phases. The theorisation of concepts constituted the first phase of the research along with the development of the framework. The second phase of the research involved the evaluation of the framework.

1.4.1 Research questions

The main research question that the study intended to answer was: "*How can one improve the value creation process that is supported by information systems in the South African healthcare ecosystem?*

The following sub-questions were intended to address the research problem:

- What are the key value creation concepts considered from an ecosystem perspective?
- What role do information systems have in value creation?
- What are the key defining characteristics of the ecosystem construct?
- How can these characteristics relate to healthcare systems in developing countries?

The research was further guided by the following sub-questions in the literature review:

- What are healthcare information systems and their key characteristics?
- What are the benefits of adopting an ecosystem perspective for value creation in healthcare?
- What role do key stakeholders, in the healthcare sector, have in the process of value creation?
- What does the collaboration of these key stakeholders mean for value creation in healthcare?
- What should a value creation process supported by information systems look like in healthcare?

1.4.2 Research objectives

In order to answer the research questions, the research objectives were formulated. The objectives divide the research into two phases of which the first focused on the theorisation of concepts while the second phase focused on the evaluation of the framework's components.

In the first phase, which formed the theoretical component, the aim was to meet the objectives listed below by constructing a scoping review to gain an understanding of value, information systems and ecosystems. This was done by highlighting the definitions, characteristics and the multidisciplinary nature of these concepts. Subsequently, insight gained from the scoping review was used to formulate the conceptual literature review to gain a deeper and richer understanding of how information systems are used to create value within their ecosystem. Furthermore, an investigation on existing frameworks, models and tools relating to this context was also conducted to explore work that has been done in order to create a benchmark. A preliminary conceptual framework was developed from the trends and key elements identified in the scoping review and conceptual literature review. The scoping review, conceptual literature review and the subsequent preliminary conceptual framework form the main outcomes of this phase.

The second phase of the research objectives was where the research study was evaluated. The evaluation process was carried out in three parts. First, a theoretical case study was conducted to assess the framework against the standards of an existing value creation initiative developed within the South African healthcare context. Second, semi-structured interviews with industry experts were conducted to evaluate the categories and concepts of the framework and also to identify concepts that were potentially overlooked by the researcher. Finally, an industry case study and subsequent framework ranking activity was used to determine the framework's usefulness as a value creation system and effective management tool.

The abovementioned phases aimed to address the individual research objectives listed below:

Phase 1: Theorise concepts and develop a preliminary conceptual framework to guide the design and development of a value creation system enabled by information systems in the South African healthcare context:

- RO1: Identify and examine fundamental value creation concepts from an ecosystem perspective by formulating a scoping review.
- RO2: Establish the context and requirements for a value creation process that is supported by information systems within complex and dynamic ecosystems by formulating a conceptual literature review.
- RO3: Explore and assess existing frameworks, models and tools that are relevant to value creation and ecosystem design and management.
- RO4: Formulate a preliminary conceptual framework to aid in the design, development and implementation of a value creation system.

Phase 2: Evaluate, modify and refine the preliminary conceptual framework developed in Phase 1 into a management tool:

- RO5: Use an existing value creation initiative to gain an understanding of how a value creation system should function in the South African healthcare context and to modify the preliminary conceptual framework prior to evaluation in practice.
- RO6: Conduct interviews with industry experts to evaluate the content of the developed framework and formulate a revised and modified framework.
- RO7: Apply the framework to an appropriate case study using real world scenarios to assess its usefulness.
- RO8: Present a management tool for the design, development and implementation of a value creation system in the South African healthcare context.

1.5 Research scope and limitations

The research considered a holistic system-perspective of value creation by focusing not only on the collaboration of ecosystem actors who interact through the use of information systems but also on the ecosystem as a whole. Literature that was to be used in the research included multiple sources that span across multiple disciplines and various developing and developed countries. This aided in the development of the framework which is situated in the South African health context. The scope of the research is presented in Figure 1.3.

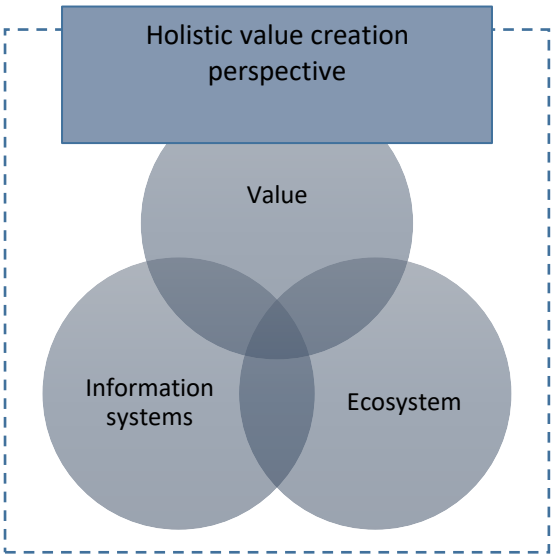


Figure 1.3: Scope of research

1.5.1 The delimitations of the research

The intended scope of the research was maintained by delimitations at various stages of the research development. The most prominent delimitations include the criteria applied during the scoping review and the criteria used to search for appropriate frameworks, models and tools. The delimitations of the research were:

1. The focus of the research was at a macro level as the research adopts an ecosystem perspective with the aim to develop a strategy for the larger healthcare system through the consideration of the internal factors of a healthcare system and the wider external factors that tend to impact value creation. The research involved developing a management tool, enabled by information systems, to produce a context-specific artifact that encourages the creation of value within the boundaries of four key components. These components are the phenomenological, co-creation, multidimensional and emergent components;
2. Focus was on the principles and practices of co-creation and their role in value creation within an ecosystem;
3. The application focus was in the South African healthcare context with multiple sources spanning across multiple disciplines and varying geographical areas consulted to further inform the research;
4. The research has the potential to provide researchers, policymakers, and health care workers with a branch of knowledge for strategic value creation;
5. The research has the potential to increase the adoption of effective co-creation mechanisms, that advocate for the inclusion of commonly marginalised communities, in order to realise the goals of value creation.

1.5.2 The limitations of the research

Several limitations arose in the study as a result of the chosen scope that was used to guide trajectory of the research. These limitations were:

1. The research does not account for every possible dynamic that is associated with value creation within complex healthcare systems, only those that emerged from insight gained from literature and industry experts;
2. The research does not account for the technical components that comprise information systems, but rather focuses on the role of information systems in managing and transmitting information between platform participants;

3. The framework is one that is conceptual in nature and therefore requires an adequate understanding of the complex healthcare system prior to its use;
4. The research delivers a broad conceptualisation of value creation for stakeholders, however it does not provide an investigation into the value that aligns with the interests of each of the stakeholder groups that exist in multiple stakeholder domains.

1.6 Brief overview of research design

A combination of methods were followed in the research study to: develop theory, build the framework and evaluate the framework. The research followed a grounded theory inspired methodology suggested by Jabareen [27] for the development of a conceptual framework. This method, namely the Conceptual Framework Analysis (CFA), was linked to the four phases comprising the research study. Phase one consisted of an overview of the problem landscape and background as well as scoping review to understand the multidisciplinary literature. Phase two involved an in-depth conceptual literature review and an investigation of existing frameworks, models and tools in order to formulate the preliminary conceptual framework. Phase three is where the proposed framework was evaluated and adapted. Finally, phase four of the study is where the final framework and management tool is presented and discussed. Figure 1.4 presents the four phases of the research and their subsequent outcomes.

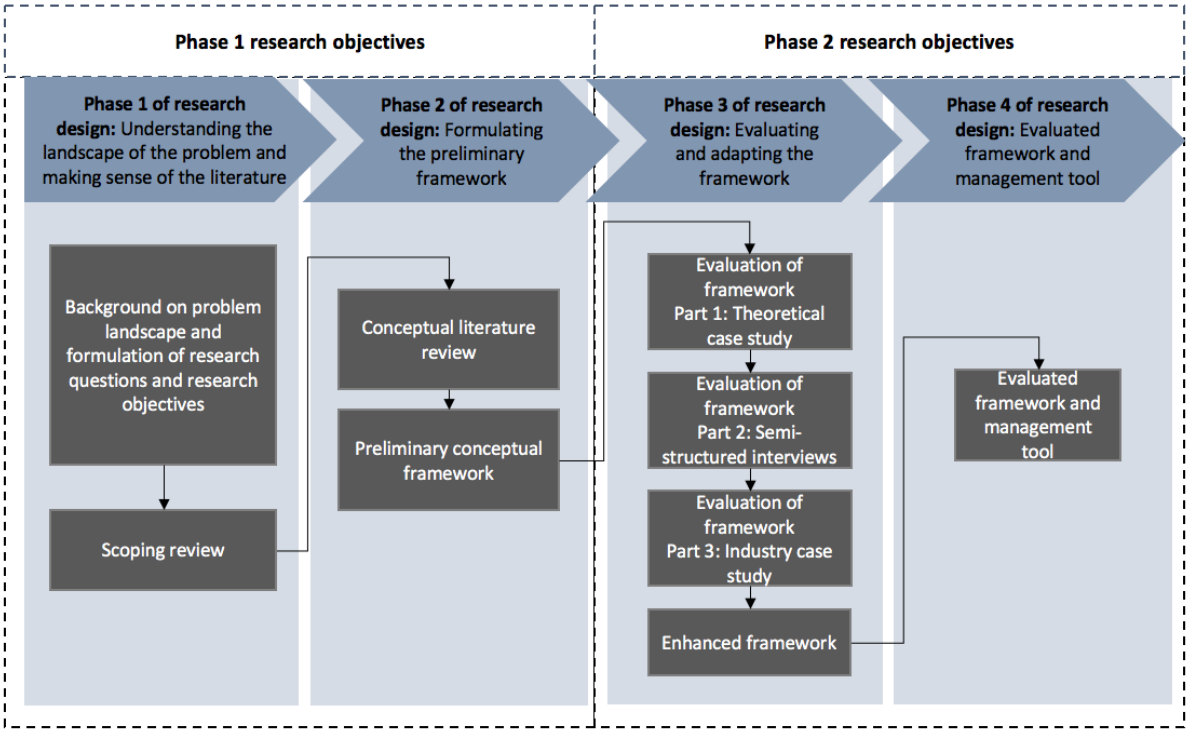


Figure 1.4: Overview of research approach followed in the study

1.7 Ethical implications of the research study

Despite the focus of the research being in the South African healthcare system context, there were no significant ethical implications during the execution of the research. The research did not rely on any sensitive data or information, but rather, used published literature to develop the theories for the framework. The involvement of industry experts in the evaluation phase of the research required that ethical clearance be obtained from the Research and Ethics Committee (REC) of Stellenbosch University. The research project, ING-2020-16817, was granted ethical clearance from the REC to conduct interviews with industry experts on the condition that:

1. Potential participants understood that their participation in the research was completely voluntary and that they had the right to withdraw from participating at any point during the project should they wish to;
2. The researcher obtained consent from the participants prior to the commencement of the interviews;
3. Information gathered from the interviews remained confidential and that the participant's personal information remained disclosed;
4. The data collected during the interviews was securely stored.

1.8 Overview of document structure

The document consists of ten chapters which progress according to the four phases of the research which are discussed in detail in Chapter 2. At the beginning of each chapter, a summary of the key objectives that the chapter aims to address will be presented. A summary of each chapter is given next.

Chapter 1: Introduction

Chapter 1 introduces the context of the research study by providing a background and overview of the main concepts of the research which include information systems, value and healthcare ecosystems. The chapter provides a motivation for the research study which leads to the problem identification and subsequent research questions and objectives which were used to guide the development of the research. The ethical implications of the study are also discussed in this chapter.

Chapter 2: Research design and methodology

Chapter 2 presents the research design and methodology used to meet the project objectives. The chapter discusses the CFA, inspired by the grounded theory methodology, and the phases used in the research. The chapter also discusses the steps followed to conduct the scoping review and various evaluation methods that were followed during the development of the conceptual framework.

Chapter 3: Scoping review

The outputs of the scoping review are presented in Chapter 3. The review was the primary method used to identify fundamental concepts relating value, information systems and ecosystems. These concepts form the foundation on which the following chapters are built and essentially were used to guide the development of the framework.

Chapter 4: Conceptual literature review

This chapter 4 comprises an in-depth investigation of the fundamental concepts identified in the scoping review to gain a deeper and richer understanding prior to the development of the framework. The investigation provides an understanding of the core characteristics and dynamics of ecosystems, information systems and value. The chapter also gives an overview of identified frameworks, models and tools that already exist in literature to further inform the development of the framework.

Chapter 5: Framework evolution Part 1: Towards the development of a preliminary conceptual framework

Chapter 5 presents the preliminary conceptual framework formulated from the trends and key elements identified in the scoping review in Chapter 3 and the conceptual literature review in Chapter 4. This forms the first part of the framework evolution process. The concepts incorporated into the framework draw from diverse literature such as the business ecosystems, information systems, social science, data-driven ecosystems, and Institutional theory. The resulting preliminary framework comprises three dimensions each with their own set of concepts that need to be considered. The dimensions include the external environment, the organisation and the stakeholder.

Chapter 6: Framework evolution Part 2: Theoretical evaluation of preliminary conceptual framework

Chapter 6 forms the second part of the evolution process and first part of the framework evaluation process. The preliminary framework was evaluated by means of a theoretical case study on Netcare's value creation initiative. This yielded insight into the adherence of the framework to the standards of an existing value creation initiative in the South African healthcare context. Subsequently, the framework was modified and adapted.

Chapter 7: Framework evolution Part 3: Semi-structured interviews with subject matter experts

Chapter 7 from part three of the evolution process and the second part of the framework evaluation. In this chapter semi-structured interviews with industry experts from varying disciplines were conducted to evaluate the categories and concepts of the framework and also to gain additional insight from these experts. The data from the interviews was extensively examined through coding cycles and notable findings and insight were used to modify the framework.

Chapter 8: Framework evolution Part 4: Practical case study application

Chapter 8 forms the fourth and final part of the framework evolution process and the final part of the evaluation process. This evaluation process involved an in-depth industry case study completed on a successful digital healthcare organisation, Jembi Health Systems. The framework and its dimensions were applied to this practical case to verify the suitability of the framework as a tool that can be used to create value in the healthcare context. Furthermore, a framework ranking exercise was used to further verify the relevance and usefulness of the framework. Insight gained from both these two activities resulted in the modification and refinement of certain framework items.

Chapter 9: The evaluated framework and management tool

Chapter 9 presents an overview of the motivation and purpose for developing the framework. This includes a thorough discussion and explanation of the management tool and its overarching dimensions. Specific attention is given towards important considerations for the use of the tool within the South African healthcare context.

Chapter 10: Conclusion and recommendations

Chapter 10 forms the concluding chapter of the research study. The research design is revisited in this chapter with a summary of each of the research phases provided. The project objectives and the chapters within which they have been addressed in the study are also presented in this chapter. The chapter concludes with a discussion on the limitations of the research and the recommendations for future avenues that can be pursued.

1.9 Chapter 1 Conclusion

The research motivates a novel management tool that aids in the creation of value to ensure long lasting economic and environmental sustainability in healthcare. Through the successful implementation of a value creation system, that is supported by information systems, there is great potential to contribute to better health and well-being of a population. The benefits span across various healthcare systems and may particularly have the largest impact on public healthcare systems in South Africa. Thorough research on the barriers that affect effective management and use of information in these systems will improve our understanding on how and where value can emerge within complex healthcare systems. Conducting the research study occurred in two phases. The first phase consisted of the theorising concepts and developing the conceptual framework. The development of the conceptual framework relied on literature obtained from the scoping review and the conceptual literature review. The second phase of the research involved evaluating the developed framework by applying it to case studies and through semi-structured interviews with industry experts. The resulting value creation system aims to assist researchers, policy makers and

healthcare workers in understanding the strategic characteristics for value creation in order to contribute its creation within the healthcare system.

Chapter 2: **Research design and methodology**

2.1 Introduction

Chapter 2 provides an overview of the research methods which were considered for the development of the project's research design. The research is qualitative in nature and is guided by the conceptual framework analysis approach suggested by Jabareen [27] to develop the framework. The CFA approach follows a grounded theory methodology which aided in developing the theory. The first four phases of the CFA process were used together with a scoping review, conducted in Chapter 3, and a progressive evaluation process to develop the final framework and management tool. The evaluation of the framework takes place in Chapter 6, Chapter 7 and Chapter 8. The CFA approach was adapted accordingly to ensure that the processes conducted allowed for the research objectives to be met. This is discussed as part of the research design in Section 2.9.

Chapter 2 objectives:

- Provide an overview of the research methods considered
- Present the Conceptual Framework Analysis process
- Discuss the scoping review
- Describe the evaluation process
- Present an overview of the research design for the project

2.2 Understanding the research paradigm

As a researcher, one needs to have an understanding of the nature of reality in order to articulate one's beliefs on what can be known about this reality and how to attain this knowledge. These elements are what essentially comprise a research paradigm. At its core, the research paradigm is representation of the researchers' beliefs and values about the world. These beliefs and values are what direct the actions of the researcher and implicate the decisions they make in the research process [28]. Understanding the use of research paradigms is therefore important as they provide this guidance and offer a unique contribution to literature [28], [29]. Figure 2.1 illustrates the theoretical framework of the research paradigm which comprises four components. These components are: ontology, epistemology, methodology and methods [30]. Ontology is concerned with the nature of existence and social entities or reality. Ontological questions are what lead researchers to inquire about the kind of reality that exists. Epistemology refers to the nature and form of knowledge and the process by which it is acquired and validated. Epistemology questions lead researchers to question whether knowledge is something that should be acquired or experienced personally. This leads to debate about objectivity, subjectivity, causality, validity, generalisability. Methodology is an approach that is theoretically informed to produce and critically analyse data. Methodological questions are what guide the researcher in deciding what type of data is required and which data collection tools are most appropriate to conduct the research study. Methods are the means by which the data is collected and analysed. The methods used in the research study depend on the research design and theoretical mindset of the researcher [28], [30].

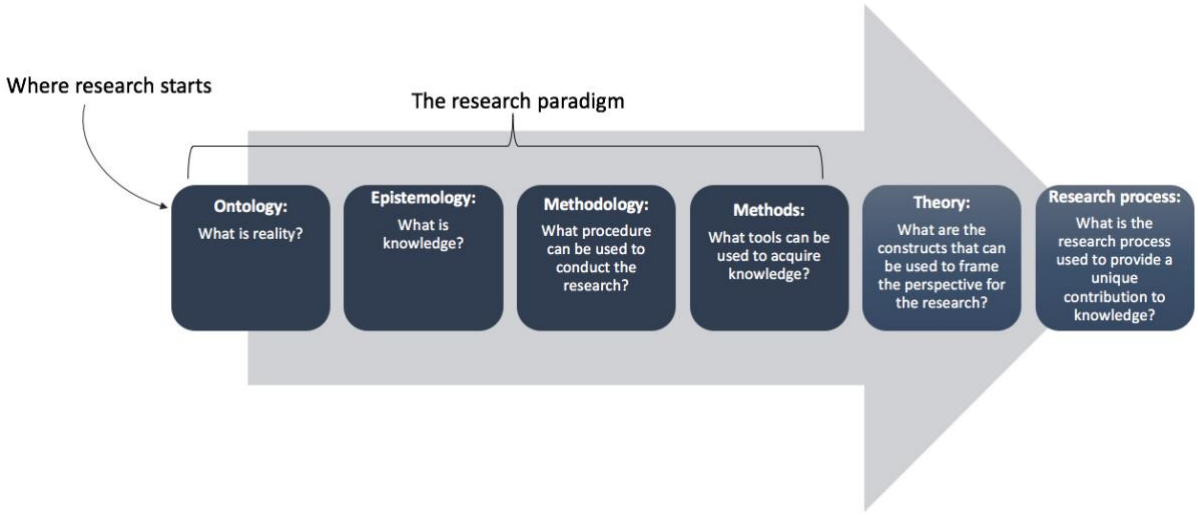


Figure 2.1: Developing a research study [28], [29]

The connection between the research paradigm, theory and the research process is shown in Figure 2.1. As can be seen, research starts with a choice of a research paradigm. The chosen paradigm is what helps the researcher to determine what theory is best suited for the study in order to guide the entire research process. Theory is a set of interrelated constructs, definitions, and propositions that explain a phenomenon. These theoretical components are what help researchers to frame the research questions, and support the analysis and interpretation of findings in the research [29].

In addition to understanding the connection between the research paradigm, theory and research process, it is also important to consider the differences that exist in theory development, epistemological orientation, and ontological orientation. This is important to adequately guide the development of the research. Table 2.1 highlights the differences between the three areas of consideration.

Table 2.1: Differences between research considerations [30]

Areas of consideration	**Differences**	
Theory in relation to research	**Deductive:** empirical testing of theory.	**Inductive:** generation of theory from data.
Epistemological orientation: Concerned with acceptable knowledge in a discipline	**Positivism:** Emphasizes the use of natural science methods.	**Interpretivist:** assumes that research approaches need to respect the difference between natural science methods and social sciences.
Ontological orientation: Concerned with the nature of social phenomena	**Objectivism:** Implies that social phenomena are beyond reach or influence.	**Constructionist:** Asserts that the social phenomena is produced by social actors through their interaction.

2.3 Qualitative, Quantitative and mixed methods

The nature of the link between theory and research can be defined as being either inductive or deductive [31]. The deductive approach is a common view of the relationship between theory and research. Here, the theory is used to deduce a hypothesis that is embedded with concepts that are researched. Conversely to this is the inductive approach in which theory is the outcome to the research [31]. Research can be conducted using either the qualitative, quantitative or mixed method approaches. Quantitative research adopts the deductive approach where emphasis is placed on theories being tested based on findings. The qualitative research approach treats theory as

emerging from the collection and analysis of data and therefore is considered to be inductive in nature [31].

The qualitative research approach attempts to study the context of the whole situation in order to evaluate and understand its complexity [32]. The approach is characterised by its aim to: (1) understand aspects of the social life, (2) collect and analyse textual data, and (3) emphasize the context within which the study occurs [33], [34]. Qualitative research approaches often consist of four essential components that need to be considered as seen in Table 2.2. These components include: the research design, the data collection methods, data analysis and interpretation methods, and components of trustworthy approach [34], [31], [35].

Table 2.2: Qualitative research design considerations [30], [34]

Qualitative research design	**Qualitative data collection methods**	**Qualitative data analysis and interpretation methods**	**Components of a trustworthy qualitative research approach**
Ethnography	Direct observation	Coding	Credibility
Phenomenological	Participant observation	Statistics	Applicability
Grounded theory	Surveys	Narrative analysis	Dependability
Case study research	Focus groups	Content analysis	Confirmability
	Language based methods		

Quantitative research is an approach that deals with quantifying and analysing variables in order to get results [36]. Here, numerical data is primarily analysed using statistical techniques to answer questions such as *who, how much, what, where, when, how many,* and *how*. The approach can be used to study a subset of a population in order to assist researchers in projecting their findings onto the larger population. This is achieved through a process that views the social reality as one that is external and objective, which the approach allows for [31], [34].

Quantitative and qualitative research are similar in certain areas of their approaches. This is particularly seen in their concern to answer the research questions and to uncover variation in collected data. Distinctions also however exist between the two research approaches. The distinction between qualitative and quantitative research approaches is useful for the classification of the different research methods and strategies [31]. The main contrasting features between quantitative and qualitative research are highlighted in Table 2.3. As can be seen in the table, the main differences between the approaches lie in their objective, methods, data collection methods and researcher involvement [31].

Table 2.3: Contrasting features between qualitative and quantitative research approaches [30]

Feature	**Quantitative**	**Qualitative**
Objective	Test theories and concepts	Discover theories and concepts from emerging data
General method	Numbers and measurement	Words and description
Data collection	Structured	Flexible
Researcher involvement	Researcher detached from subjects	Researcher involved with participants

The mixed methods research approach blends both quantitative and qualitative research methods. This approach involves collecting and analysing qualitative and quantitative data concurrently or sequentially in a single study. This data can be integrated at one or more stages in the research

process. The motivation for adopting such a research method lies in utilising the respective strengths of the two approaches while escaping their respective weaknesses. [37].

Formulating the research design should involve the consideration of the abovementioned research paradigm. This essentially will help the researcher make a decision regarding their epistemological and ontological orientation. The choice made will determine whether a qualitative or quantitative research method is used. This in turn will influence the data collection and analysis methods followed. Figure 2.2 illustrates the process of developing the research design.

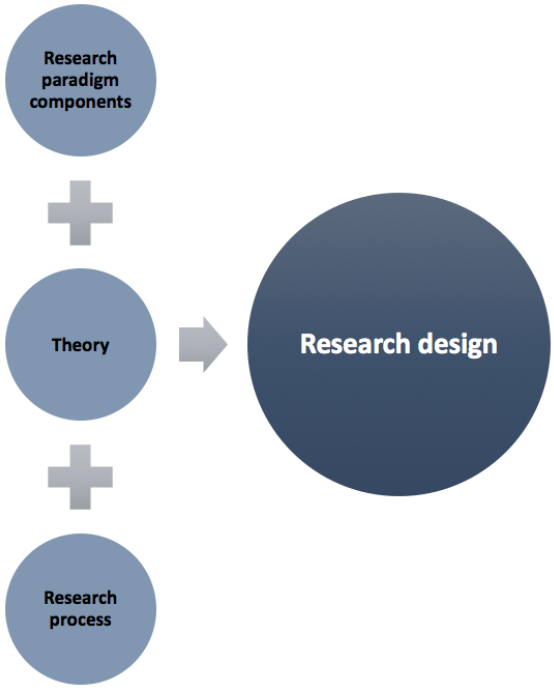


Figure 2.2: Process of developing the research design [28], [29]

A qualitative research approach was chosen to conduct the study. Ontologically within this approach, the research was built on researcher's belief that there are multiple realities which are socially constructed by actors. Furthermore, due to the complexity of the phenomena under study, the epistemological implication of this angle is assumed to be achieved through the establishment of an understanding of the diverse realities constructed by the social actors.

2.4 Grounded theory

Grounded theory has become a widely used methodology since its development by Barney Glaser and Anselm Strauss in 1967 [31]. Grounded theory was developed as a response to the criticism that qualitative research received, as it was often derided as impressionistic, anecdotal, unsystematic and biased [38]. The development of the methodology challenged the status quo in social research, as contemporary studies were dominated by research that was deductive in nature [38]. Since it was first presented, grounded theory has been subjected to numerous definitions and interpretations which resulted in an ideological split between Barney Glaser and Anselm Strauss in 1990 [38].

Grounded theory is a methodology that is primarily associated with qualitative research and is widely used to generate theory. It is an innovative methodology that facilitates 'the discovery of theory from data'. Its focus is not on testing hypotheses taken from existing theoretical frameworks but rather to develop new theory grounded in collected empirical data. The methodology was developed with the

intention of bridging the gap between theoretically uninformed empirical research and empirically uninformed theory by grounding it in data [38][39].

2.5 Conceptual framework development

The conceptual framework analysis developed by Jabareen [27] is a technique that follows the grounded theory approach. The aim of the analysis is to generate, identify and trace key concepts of the phenomenon under study to form a theoretical framework. Furthermore, the analysis aims to develop concepts that have their own: attributes, characteristics, assumptions, limitations, distinct perspectives and specific functions within the framework. This is essentially to provide further insight into the phenomenon represented by the concepts [27].

Social phenomena, in contemporary times, are multifaceted as they are linked to multiple bodies of knowledge from various disciplines. For this reason, a multidisciplinary approach such as the CFA is required to adequately scrutinize such phenomena [27]. The CFA process is one that is iterative as it requires constant comparison across theory emerging from different disciplines [27]. The procedure for the CFA process, as suggested by Jabareen [27] is illustrated in Table 2.4 and consists of eight phases which will be used to develop the framework of the research study.

Table 2.4: Phases and description of CFA process [26]

Phase	Description
Phase 1: Mapping the selected data sources	Review multidisciplinary text extensively in order to map the spectrum of literature of the phenomenon in question. Data collection should be comprehensive and complete to facilitate holistic mapping and validity.
Phase 2: Extensive reading and categorising of the selected data	Read the selected data and categorise it by discipline and by order of importance and representative power within each discipline to ensure effective representation of each discipline.
Phase 3: Identifying and naming concepts	Read and reread the selected data in order to discover emerging concepts that compete and sometimes contradict one another.
Phase 4: Deconstructing and categorising the concepts	Deconstruct each concept to identify its main attributes, characteristics, assumptions and role. Concepts should be organised and categorised according to their features.
Phase 5: Integrating concepts	Integrate and group together concepts that are similar into one new concept to drastically reduce the number of concepts.
Phase 6: Synthesis, and re-synthesis	Synthesize concepts into a theoretical framework through an iterative process that involves repetitive synthesis and re-synthesis until a general theoretical framework is recognised.
Phase 7: Validating the conceptual framework	Validate the conceptual framework by determining whether the proposed framework and its concepts make sense to the researcher and other scholars and practitioners.
Phase 8: Rethinking the conceptual framework	Revise theoretical framework according to new insight, comments and literature.

2.6 Scoping review

Scoping reviews have become increasingly adopted as a method that is ideal for synthesizing a body of knowledge that has not been extensively reviewed or is of a complex nature [40]. The scoping review achieves this by presenting an overview of the field of research by identifying and mapping available literature in order to draw conclusions and identify gaps [41], [42]. This process involves identifying and evaluating existing work produced by researchers, scholars and practitioners [42]. The approach encourages a detailed documentation of the review process to ensure that the study is reproducible in order to increase the reliability of the findings [43].

The purpose of conducting a scoping review in this study was to identify the key concepts illustrated in Figure 2.3 that relate to value, information systems and ecosystems. The scoping review was conducted in accordance with the first four phases of the CFA process. Thereafter, the stages pertaining to the formulation of the preliminary conceptual framework were conducted.

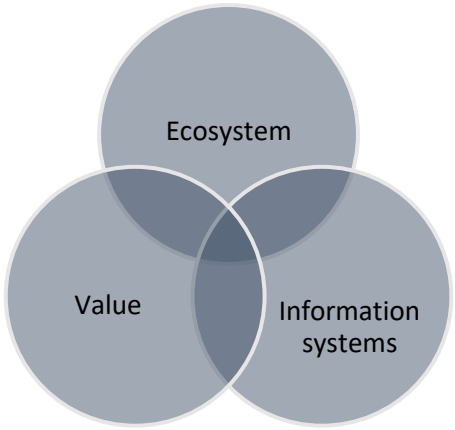


Figure 2.3: Main concepts for scoping review focus

Conducting the scoping review was an iterative process as the researcher had to constantly compare newly emerging theories. Furthermore, iteration was present during the evaluation phase of the CFA as the researcher had to rethink and make adjustments to the framework.

2.7 Validation

The concept of research validation, be it quantitative or qualitative, requires that the philosophy of science that frames the research, be considered [44]. In quantitative research, reliability and validity are two aspects that have been traditionally operationalised in the research method and are said to be key in the formulation of research [45]. Reliability is concerned with the repeatability of a study's results while validity is concerned with the integrity of the conclusions generated from research [31]. According to researchers, reliability and validity can be equated to rigor and trustworthiness in qualitative studies, which are all components of quality [45].

Qualitative research can be evaluated using different criteria which can be divided into two basic groups, namely extrinsic criteria and intrinsic criteria. Extrinsic criteria can be imported from quantitative research and adapt to qualitative research, while intrinsic criteria is exclusively based on the qualitative research context [44]. It is suggested that qualitative studies be evaluated using intrinsic criteria as it increases the credibility of the research [31], [44]. Triangulation is another method that is encouraged to be used in order to understand the complex social realities in qualitative research in a manner that is reliable and valid [31].

Triangulation is a strategy that is used in the study of social phenomena to cross-check findings, achieve reliability and enhance validity [31], [46]. It uses multiple methods in order to converge information from different data sources to develop a comprehensive understanding of the phenomena under study [47]. Triangulation was originally conceptualised by Webb, Campbell, Schwartz and Sechrest in 1996 with the purpose of developing measures for concepts in order to increase confidence in findings [31]. Methods frequently used in qualitative studies when using the triangulation strategy include: in-depth interviews, focus groups, observations, surveys and questionnaires [31], [47]. The triangulation method used in the research study is presented in Figure 2.4.

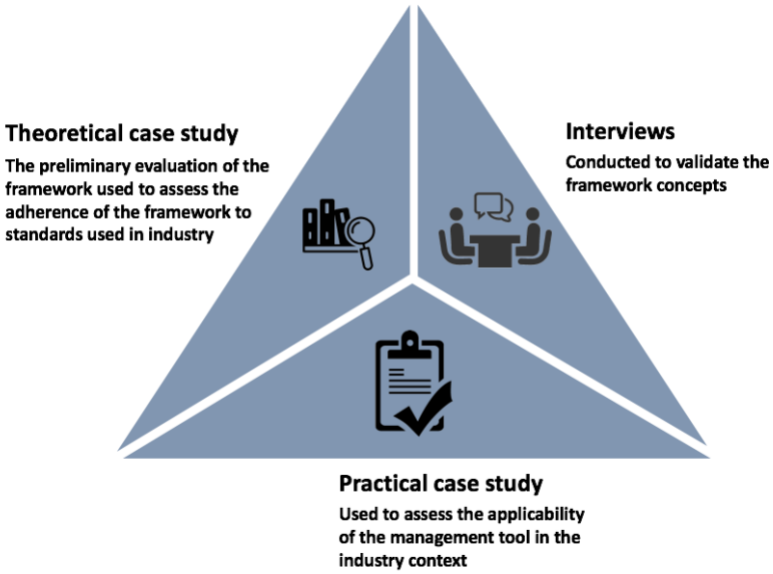


Figure 2.4: Triangulation method used in research study

2.7.1 Interviews: Semi-structured interviews

Rigorous data collection methods are necessary in qualitative research as these methods greatly influence the quality and trustworthiness of a research study's results [48]. The most commonly used data collection methods in research are interviews. In qualitative research pertaining to the healthcare context, the semi-structured interview format is the most frequently used of all the interview types. Semi-structured interviews are popular as data collection methods in qualitative research mainly due to their flexibility and versatility. This flexibility and versatility can be seen in the method's ability to be used in an individual or group setting and its ability to vary in rigidity depending on the study's purpose and research questions [48], [49].

The semi-structured interview is designed to ascertain subject related responses from persons regarding a particular phenomenon they have experience with. This requires a certain level of understanding of the research topic in question by both the interviewer and the interviewee. An interview guideline, which forms the structure of the semi-structured interview, also requires sufficient knowledge about the phenomenon to develop the appropriate questions [48], [49]. The guideline is developed prior to the commencement of the interview and is used to cover the main topics of the research study [48].

There are several drawbacks linked to semi-structured interviews which need to be considered prior to their use in research. These drawbacks include the fact that the method is: (1) time-consuming, (2) labor intensive and, (3) entails an arduous process of analysing a huge volume of data. Despite these disadvantages, this method is one that offers many benefits as well. Semi-structured interviews are particularly suitable for a varying number of situations which are considered to be the advantages of the method. These advantages are listed below [48], [49], [50]:

1. Though not fully structured, the method allows for specific focus areas to be addressed;
2. The method allows for consistency in the interviewing style, where multiple interviews are conducted, through the development of an interview guideline;
3. The method enables reciprocity between the interviewer and the interviewee;
4. It enables the interviewer to improvise follow-up questions that probe the interviewee to touch on certain concepts of the phenomenon;
5. Allows the interviewee the freedom to respond candidly to the questions they are asked;
6. Visual aids can be presented to the interviewees to ascertain their perspective during the interview.

Multiple interviews were conducted with industry experts at various stages of the research study. These interviews were firstly used to inform the development of the conceptual framework and secondly to evaluate the research and its outcomes. The purpose of the interviews in the research and the procedures followed to conduct the interviews is discussed in detail in Section 7.2.

An additional method that was used to evaluate the research outcomes was the case study. An overview of the method is discussed in the following section.

2.7.2 Case study

A case study is defined as an empirical inquiry that is used to investigate a phenomenon within its real-life context [51]. By implementing a case study different aspects of the phenomenon are understood in relation to one another and as a coherent whole [51]. Qualitative case studies particularly achieve this through the use of multiple data sources which enhance the understanding of the phenomenon and help to establish internal validity of the case study [52], [53]. Data sources used in qualitative case studies may include: documentation, archival records, interviews, direct observations, participant observations and physical artifacts. In general, it is advised to use two or more of these data sources or perspectives. Each data source has its own strengths and weaknesses however a case study that is combined with interviewing is considered to have more depth as it allows for "*why"* and "*how"* questions to be asked. This is particularly necessary and important as it helps explain the fundamental reasons and background behind the nature of the issues [51], [53].

The suggested process followed in research to conduct a case study is presented in Figure 2.5. The process begins with a literature review which creates the basis for the research by proving current knowledge on the research topic. This is necessary to identify possible gaps, and to define the research questions and strategy going forward [51]. Developing the research questions is an important step as the research methodology is based on this. Following selection of the research methodology is the selection of a suitable case. This process is very critical as the case selected needs to align with the research and its aim. When data is collected during the case study, several data sources and research informants should be utilised. This is particularly important to ensure that a variety of perspectives are captured to limit biases. Analysing the data follows the data collection stage and is another critical phase in the process. This process involves data reduction, data display and various other techniques which are used to draw conclusions, make recommendations and present implications [51].

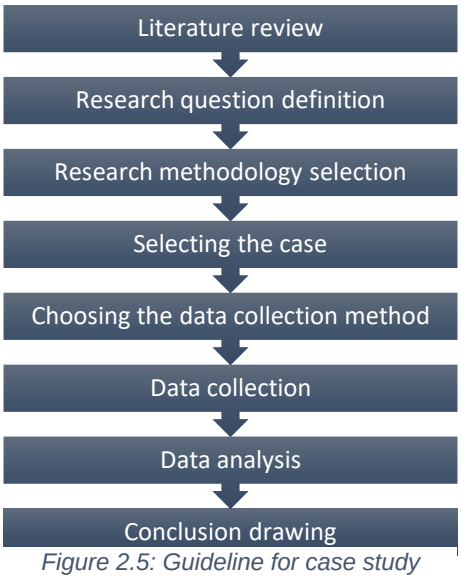


Figure 2.5: Guideline for case study process [50]

Despite the criticism that case studies receive in literature, it is a research method that has been found to be useful when analysing a research topic. A critical component in both semi-structured interviews and case studies is the data analysis process. The way in which collected data is analysed plays an important role in the richness of the insight that is gained from it. If it is conducted in a proper manner, important and interesting results can follow.

2.8 Data analysis in research

Data analysis is a process that helps one make sense of the data that is collected by taking the data apart and putting it back together [54]. The process is one that begins during the early stages of data collection and continues throughout the study [55]. In qualitative research, the suggested process to follow to analyse data is presented in Figure 2.6. Although presented in a linear manner, the process is considered to be one that is ongoing and iterative. Organising and preparing the data forms the first step of the process and involves arranging the data into a suitable format. The second step involves reading the data to make sense of the information by reflecting on the meaning of the data. The third step is where the data is coded. Coding the data refers to a process in which the data collected is categorised, labeled and organised by allocating specific terms to the categories. The coding process is one that has its own set of rules and processes that need to be followed to successfully complete [54].

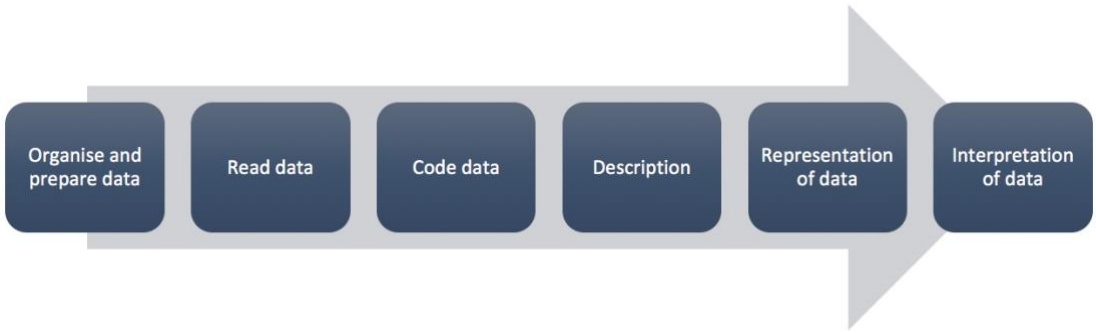


Figure 2.6: Data analysis process followed in qualitative research [53]

The fourth step of the data analysis involves using the coded data to generate a description of the settings, categories or themes of the data. Researchers can further use these themes to build additional layers that go beyond descriptions and theme identification to form more complex theme connections. Step 5 advances how the descriptions and themes are presented. Some approaches for this include a chronological discussion of events, a detailed discussion of themes, or a discussion of interrelatedness of the themes. Researchers can also use visuals, figures, or tables as tools to convey information. The final step of the data analysis process involves interpreting the finding or results from the data. Here, the lessons learnt from the research are clarified and new questions for future work are highlighted [54].

The qualitative research methods, data collection and data analysis, were used to formulate the research design. The research design, discussed in the following section, was followed during the development of the research in order to meet the project objectives.

2.9 Research design

The research conducted in this study is qualitative in nature and follows the CFA methodology that is based on the grounded theory approach [27]. The theory used in the research study is founded entirely on insight gained from the analysis of collected data. The research approach and the various research methods, which have already been introduced, were used in the various phases of the study to add depth and richness. These phases consist of the eight steps of the CFA process which

were adapted for the formulation of the study. The CFA steps, research phases and research chapters are presented in Figure 2.7.

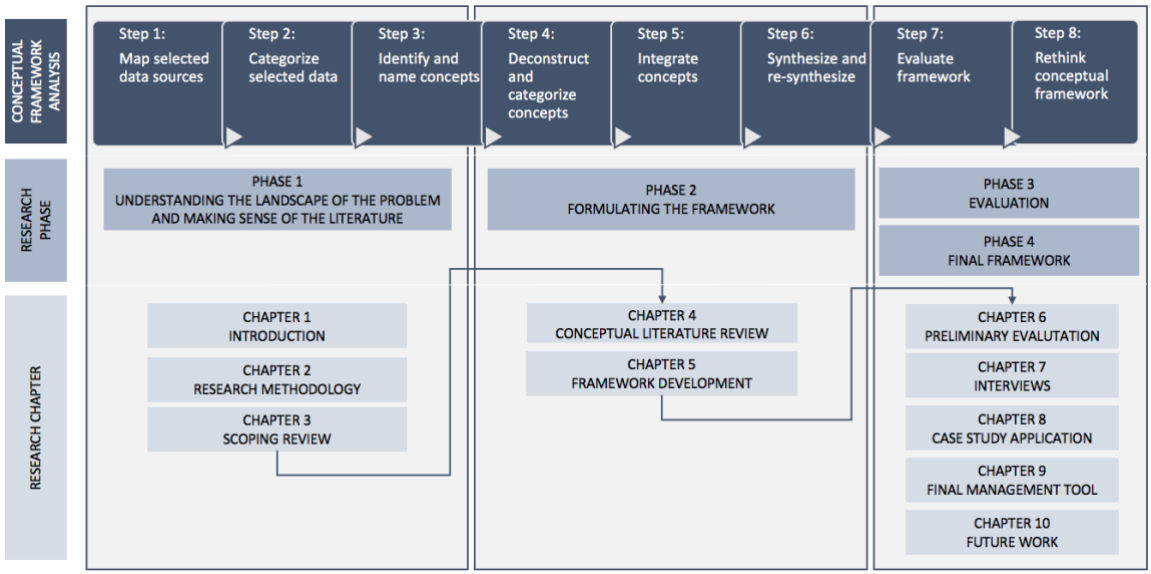


Figure 2.7: Overview of research design

The figure shows where the different steps of the CFA process fit into the phases of research approach. Phase 1 consists of the elements required to adequately understand the multidisciplinary literature in order to formulate the aims and objectives of the research. Phase 2 involves an in-depth study on the literature and investigation of existing frameworks, models and tools in order to formulate the conceptual framework. Phase 3 is where the evaluation of the proposed framework takes place. Finally, phase 4 of the study is where the evaluated framework is presented and discussed. Each of these phases are discussed in more detail in the following sections.

2.9.1 Phase 1: Making sense of the literature

The first phase of the research methodology focuses on establishing an adequate understanding of the multidisciplinary literature of the research. In this phase, the problem and the objectives that the research aimed to address were clearly defined, as was done in Chapter 1. This is then followed by the formulation of the scoping review completed in Chapter 3. The scoping review had three aims and was guided by the Arksey and O'Malley framework [43] which aided in presenting an overview of the complex phenomenon under study. The first aim of the scoping review was to identify key concepts in literature that related to value creation within the context of information systems and the ecosystems within which they operate. The second aim was to determine the key ecosystem actors highlighted in literature to obtain an overview of the roles that they play. The final aim was to highlight the definitions and characteristics of the focus areas as well as to highlight the multidisciplinary nature of the concepts. The results from this chapter formed the foundation for the rest of the research study. A summary of the components of Phase 1 are shown in Figure 2.8.

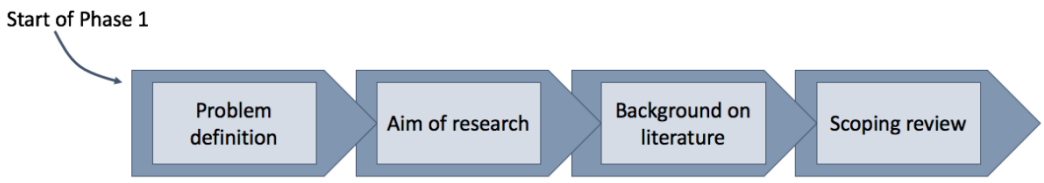


Figure 2.8: Summary of Phase 1 of the Research Design

2.9.2 Phase 2: Formulating the framework

Phase 2 of the research study, shown in Figure 2.9, focuses on using knowledge gained from Phase 1 to guide the investigation of the literature used to develop the preliminary conceptual framework. The framework was formulated directly from the outcomes of phase 1 as well as from in-depth conceptual literature review that was conducted in this phase. This phase consists of an investigation of current frameworks, models and tools that relate to creating and managing value with the support of information systems within an ecosystem. These frameworks, models and tools were evaluated and used to inspire the development of the preliminary conceptual framework.

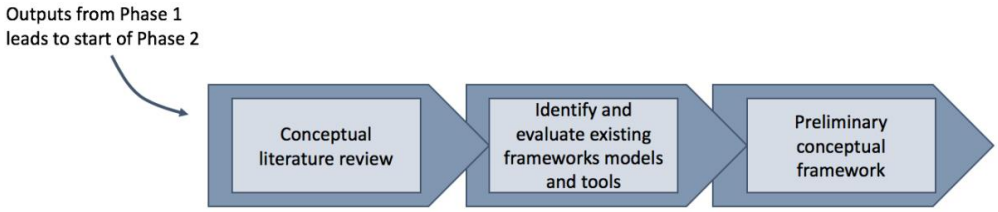


Figure 2.9: Summary of Phase 2 of the Research Design

2.9.3 Phase 3: Evaluation

The third phase focuses on evaluating the framework. Jabareen [27] suggested evaluating the framework following the synthesis and re-synthesis steps of the CFA process. This was essential to determine whether the content of the framework made sense and to obtain input on the framework from external experts. In the research, an evaluation process was followed over a validation process. This is largely owed to the fact that the conceptual framework is one that is comprehensive and continuously changing and therefore requires an evaluation process to be implemented. Furthermore, a validation process aims to prove accuracy rather than showing how applicable and valuable the framework is, which the evaluation process aims to do.

The evaluation process that was followed in the research consisted of three parts. The first part of the process formed a preliminary evaluation of the framework. A theoretical case study focusing on Netcare's value creation initiative was used here to assess the framework against an existing value creation initiative developed within the South African healthcare context. The second part of the evaluation process included the use of semi-structured interviews for the purpose of gaining additional insight and identifying missing concepts. The final part of the evaluation process concluded Phase 3 of the research approach. This stage consisted of an in-depth industry based case study and subsequent framework ranking exercise. The case study was completed on a successful digital healthcare organisation, Jembi Health Systems. The case study was used to verify the framework's suitability as a management tool for value creation healthcare. The framework ranking exercise involved industry experts ranking the framework using predefined criteria to assess the relevance and usefulness of the framework. A summary of the components of Phase 3 of the Research Design is presented in Figure 2.10.

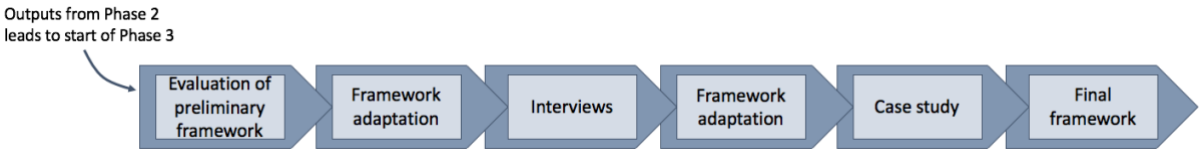


Figure 2.10: Summary of Phase 3 of the Research Design

Figure 2.11, indicates the context of the evaluation process within the larger research study. In the figure, the framework evolution, evaluation process and evaluation outcomes are presented. The evolutionary nature of this process involves the framework evolving from preliminary conceptual framework to a final tool as shown by the gradually darkening squares on the left side of the figure.

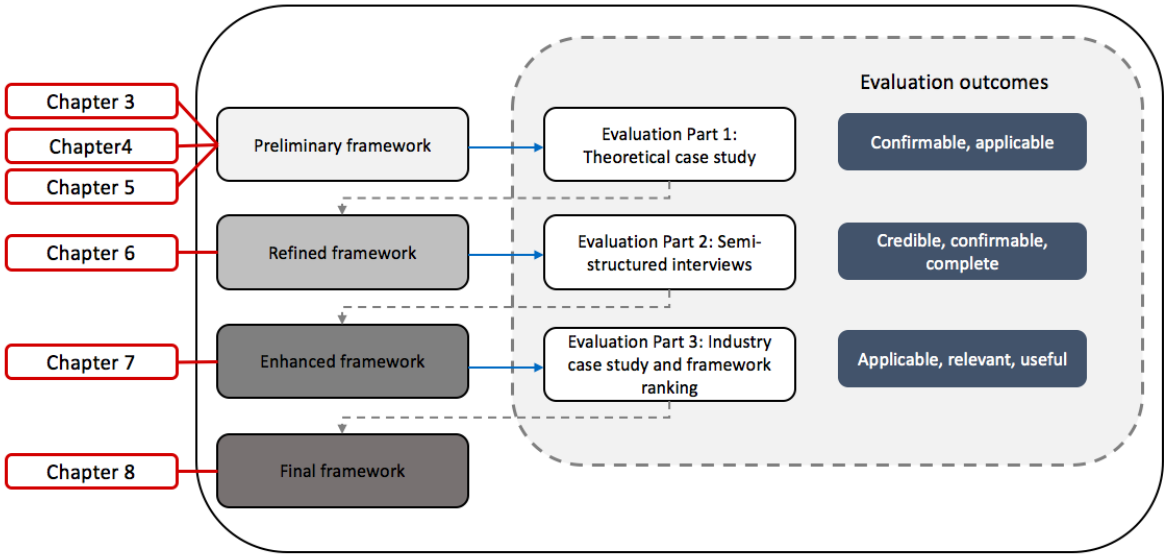


Figure 2.11: Evolution of framework, progressive evaluation process, and evaluation outcomes

2.9.4 Phase 4: Final framework

The final framework and management tool is developed in this fourth and final phase of the research. This comes a result of the progressive adaptations and modifications that took place in Phase 3. Phase 4 of the research approach consisted of presenting the final management tool. The motivation for the development of the framework and its use, specifically in the South African healthcare context, is discussed here. The phase is concluded by a discussion of the study limitations, recommendations and future work. The overview of the components of Phase 4 are shown in Figure 2.12.

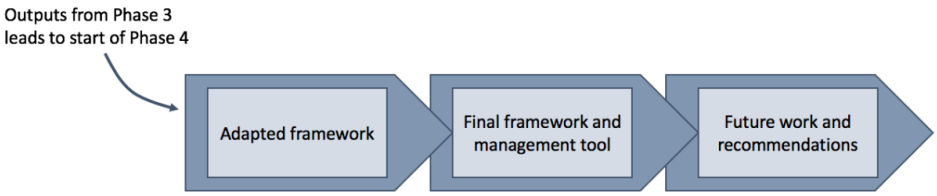


Figure 2.12: Summary of Phase 4 of the Research Design

2.10 Chapter 2 summary

This chapter provided a short overview of the different research approaches that were considered to develop the research design. The CFA process and scoping review process were introduced and discussed in this chapter. A description of how the CFA steps were executed within the four primary phases of the research design was also explained. The four phases include Phase 1: Making sense of the literature, Phase 2: Formulating the framework, Phase 3: Evaluation and Phase 4: Final framework.

Chapter 3: **Scoping review**

3.1 Introduction

In modern day times, the study of social phenomena has become complex as multiple bodies of knowledge from different disciplines intertwine. It is therefore important that the multiple disciplines of the social phenomena under study are fully understood [27]. The study of the literature must be open-minded as well as transparent in terms of how and why the topic was chosen. The method must be one that is reproducible and should involve identifying, evaluating and synthesizing existing completed and recorded work produced by researchers, scholars and practitioners. A qualitative method is used to adequately investigate the complex phenomena using a methodical approach. This approach of reviewing literature is referred to as the scoping review [43]. In this chapter the scoping review is presented and discussed. The review forms part of the first four phases of the Conceptual Framework Analysis (CFA) and is the first part of the larger project. The chapter firstly discusses the difference between systematic literature reviews and scoping reviews in Section 3.2. This is followed by a description of the methodology used to conduct the scoping review in Section 3.2, Section 3.3, and Section 3.4. The descriptive and conceptual outcomes from the review are then presented in Section 3.5 and Section 3.6 respectively. Finally, the chapter ends with a discussion on the limitations of the review which concludes the chapter. The content of this chapter forms part of an article that was accepted and presented at the IEEE International Conference on Engineering, Technology and Innovation 2020 which was held as a virtual conference due to the COVID-19 pandemic [56].

Chapter 3 objectives:

- Discuss the difference between a systematic literature review and a scoping review
- Discuss the plan for the review
- Present the descriptive outcomes of the scoping review
- Present the conceptual outcomes of the scoping review
- Discuss how the outcomes of the review relate to future research

3.2 Deciding between a systematic literature review and a scoping review

Deciding between the systematic literature review approach and the scoping review approach needs to be carefully considered [41]. Though there are other approaches in literature such as realist reviews, mixed methods and concept analyses, the focus is specifically on the choice between systematic reviews and scoping reviews [41]. The choice to conduct one over the other is determined firstly by the questions the researcher is asking and secondly by what the researcher is aiming to achieve with the review. If the researcher has precise questions that address feasibility, appropriateness, meaningfulness or effectiveness of the phenomenon in question then a systematic literature review is likely to be appropriate [41]. A systematic literature review, broadly defined, is an evidence based paradigm that follows a structured pre-defined process that is rigorous to ensure reliable, unbiased and meaningful results. Systematic literature reviews are used to retrieve evidence from relevant literature to: (1) uncover international evidence; (2) confirm current practices, address variation and identify new practices; (3) inform practice, policy and further research; (4) identify conflicting results; and (5) produce statements to guide decision making process [41]. Despite the use of systematic literature reviews to address these aspects, there are cases where the researcher is more interested in identifying certain characteristics and concepts of papers in order to map and discuss the discoveries [41]. In such instances, systematic literature reviews would be inadequate in meeting such requirements. Scoping reviews have emerged as an approach that is valid and appropriate to meet these requirements. Scoping reviews are used to determine the scope of a topic under study by giving an indication of the volume of the literature and studies available as well as providing a broad or detailed overview of its focus. The general purpose for

conducting scoping reviews is: (1) to identify the types of evidence that is available in the field under study; (2) to clarify important concepts and definitions in literature; (3) to examine how research is conducted on certain topics and in certain fields; (4) to identify important characteristics that relate to a concept; (5) to use as a precursor to a systematic literature review; and (5) to identify and analyse gaps of knowledge [41].

3.2.1 Purpose of performing the scoping review

It is important to review literature in a manner that is thorough and fair otherwise it will be of little scientific value [57], [58]. The process of reviewing literature should always be approached with rigor to ensure that it is: (1) systematic in following a methodological approach; (2) clear in describing the procedure followed to conduct the review; (3) comprehensive in its scope of including all the appropriate studies to support the review; and (4) reproducible by others who wish to follow the same approach when reviewing the topic [42], [59].

The main purpose for performing the scoping review was to provide the researcher with the overall picture regarding the landscape of the research. The scoping review was identified as the appropriate method to help the researcher to explore the research topic in order to identify the gaps in the literature that needed investigation. The review guided the researcher to answer the research questions and meet the project objectives. The aim of conducting the review was essentially to form a foundation for future research by: (1) identifying key concepts relating to value creation, information systems and ecosystems; (2) highlighting definitions and characteristics of the concepts; and (3) highlighting the multidisciplinary nature of the concepts.

3.2.2 Procedure in conducting the scoping review

The methodology of the scoping review is underpinned by views from the systematic literature review that require the review to be conducted in a rigorous and transparent manner [43]. The systematic literature review considers key characteristics that ensure this rigor and transparency. These characteristics include: (1) the development of a clear and reproducible methodology; (2) a search strategy that identifies as many relevant studies as possible that could potentially meet the predetermined criteria; (3) the documentation of the search strategy to enable the reader to assess the how rigorous it is; and (4) an evaluation of the findings obtained from the studies [58].

The scoping review conducted in the study followed a methodology suggested by Arksey and O'Malley [43] which consists of a five-step process. These steps were reinforced by the key characteristics of the systematic literature review in order to present a fair evaluation of the research topic by ensuring that the method followed was trustworthy, rigorous and audible in order to minimise bias [58]. The steps of the scoping review conducted in the study included: (1) identifying the research question, (2) identifying relevant studies, (3) selecting studies, (4) charting the data, (5) ordering, summarising and reporting the results. The process was one that was not linear as it required the researcher to repeat steps to ensure that the literature was covered comprehensively. The conceptual literature analysis proposed by Jabareen [27], was used in conjunction with the scoping review guidelines proposed by Arksey and O'Malley [43]. The CFA consists of eight phases of which the first four were merged together with the scoping review steps. An overview of the scoping review process and corresponding CFA phases is presented in Table 3.1.

Table 3.1: Review process summary

Phase in conceptual framework development adapted from Jabareen [27]	**Review guideline adapted from Arksey and O'Malley** [43] **and Kitchenham and Charters** [58]	**Application in the research project**
Phase 1: Plan the review	• Identify the need for a review • Identify the research question • Develop and evaluate the protocol	Section 3.3
Phase 2: Map selected data	• Generate search strategy • Identify relevant studies • Document the search process	Section 3.4
Phase 3: Extensively read and categorise selected data	• Assess against predetermined criteria • Document selection criteria • Select studies	Section 3.4
Phase 4: Identify, name, deconstruct and categorise concepts	• Read and reread the studies • Extract and chart data • Synthesize the studies and report findings • Categorise concepts	Section 3.5 Section 3.6

3.3 Planning the review

This section serves to provide a detailed description of the aforementioned phases in Table 3.1. Planning the review forms the first step of the review process. Planning the review included: (1) identifying the need for the review; (2) defining the research questions that the scoping review needed to answer; and (3) developing the protocol for the review. Before starting the review, it was important to identify the need for the formulation of the scoping review in a research project. Formulating the scoping review was of particular value as the researcher had little knowledge on how value emerges from a complex healthcare system that is supported by information systems. The approach aimed to form the first building block of the CFA process, and was adopted to ensure that the concepts addressed by the study were analysed and evaluated in a structured manner.

Specifying the research questions and writing up the review protocol formed the next steps in planning the review. The protocol of the review defined the methodology that was used to conduct the scoping review. The protocol included: (1) writing up a strategy that would be used to search for the primary studies; (2) developing the study selection criteria and selection procedure; and (3) formulating the data extraction and synthesis strategy [58].

The search strategy aimed to identify the primary studies that would be analysed and evaluated in the research. The process involved specifying search terms using a search strategy tool that broke down the review questions into key elements that were searched on a database. In the study, Scopus was selected as the database that was used to search for the primary studies. This was owed to the fact that it is the largest single abstract and indexing database that has been built [60]. The results from the final search were exported from the Scopus database and into MS Excel where the primary studies were synthesized based on the predetermined inclusion and exclusion criteria.

In order to ensure that the focus of the primary studies was on value, information systems and ecosystem, the scoping review developed questions based on learned information gained from literature. These questions were structured using the PICOS (Population Intervention Comparison Outcome Study) framework. The questions that needed to be answered included:

- What are the varying definitions and characteristics of value in information systems?
- What are the important concepts relating to value, information systems and ecosystems?
- What are the multidisciplinary methods and/or approaches used to analyse value in ecosystems?

The intention of the study selection criteria was to assess the actual relevance of the studies obtained. This was done by filtering through the search results to identify the primary studies that directly related to research questions [58]. To reduce the possibility of bias from occurring, the selection criteria was defined prior to the commencement of the search process.

The inclusion and/or exclusion of primary studies was determined by predefined criteria based on the review questions. The inclusion and/or exclusion criteria were classified into two categories as seen in Table 3.2. This was done to distinguish between the criteria that was used and the stage in which it was applied in the primary study selection process. Criteria in Category 1 were applied prior to fully reading the primary studies to assess the language and the relevance of the studies based on the title and abstract. Studies that were deemed relevant based on these criteria were then assessed using the criteria from Category 2. At this stage the studies had to be fully read to evaluate their feasibility and their quality.

Table 3.2: Study selection criteria

Category	Criteria	Description
Category 1	Language	English only
	Paper relevance	Studies directly related to the research question were included. The subject area and keywords of the papers formed the first criteria used to determine the paper relevance. The title of the paper then formed the second criteria used to determine the relevance of the paper. The abstract of the paper served as the third and final criteria in category 1and this determined whether or not the full paper would be read.
Category 2	Feasibility	Approaches and/or methods used to conduct and evaluate the study. In cases where a study incorporated: case studies, surveys and interviews, the number of surveys and responses as well as the number of industry experts interviewed were taken into consideration.
	Paper quality	A critical appraisal process was used to systematically assess the outcome of the study. The methodology followed and the theoretical concepts used to conduct the study had to be of standard with clear conclusions stated as well as up to standard referencing used in the study.

3.4 Data collection

The objective of this stage was to illustrate how the literature sources would be collected and mapped out. The focus of the final primary studies was on value creation that is supported by information systems from an ecosystem perspective. The data collection process consisted of four phases which included: (1) identifying literature sources on the Scopus database; (2) applying inclusion and exclusion criteria from Category 1 to identify relevant studies; (3) thoroughly reading the literature sources to further reduce number of results using criteria from Category 2; and (4) mapping the final literature sources on MS Excel.

According to Kitchenham and Charters [58], the procedure for documenting the search process when working with digital libraries requires that the: name of the database, search strategy, date of search, and years covered by the search to all be documented. Table 3.3 provides a breakdown of the results as the search terms as well as the alternative terms were added. The results were limited to full papers that were available online which meant that only 5537 primary studies were subject to be assessed using the predefined criteria.

Table 3.3: Breakdown of search results

Database	**Scopus**	
Year of publication	No limitations on the years covered by the search	
Search date:	27 January 2021	
Search term results:	Search term:	Results from database:
	"value"	1 588 730
	"Value" AND "Information system*" OR "Information technology" OR "Computerised information" OR "Data system*"	68 009
	"Value" AND "Information system*" OR "Information technology" OR "Computerised information" OR "Data system*" AND "Ecosystem*"	5537

The next phase in the data collection process consisted of the final primary studies being assessed using the predetermined criteria. This was then followed by remaining papers being read and reread in order to extract, synthesize and categorise the data [27], [58]. The process of assessing the primary studies is illustrated in Figure 3.1. The identified primary studies were first assessed using criteria from the first category. The language restriction reduced the number of studies, leaving 5532 papers remaining. The studies were then assessed to determine their direct relevance based on the subject area and keywords of the paper. Subject areas included: Business management, social sciences, engineering, decision sciences and multidisciplinary literature. The keywords considered were those related to value, information systems, ecosystems and innovation. By applying this criteria, the number of studies were reduced to 153. The title of the remaining papers were then read which further reduced the number of studies to 60. The studies that remained were then exported into MS Excel for further evaluation and subsequent categorisation. The exported data included the following information, as suggested by Kitchenham and Charters [58]: (1) authors names, (2) author(s) ID, (3) paper title, (4) year of publication, (5) source title, (6) Cited count, (7) Affiliations, (8) Abstract, (9) Author Keywords, (10) document type.

In order to determine whether the primary study would be fully read or not, the abstract of the paper was screened. This was done to further verify the relevance of the papers to the research questions. This resulted in the number of studies being further reduced to a total of 33 papers that remained. Following the application of the criteria from Category 1, that eliminated all the irrelevant primary studies, the papers were then fully read and assessed using criteria from Category 2. A final number of 24 papers remained after the final assessment and were read through thoroughly by the researcher in order to identify, synthesize and categorise the concepts that emerged from the studies. The final 24 papers derived from the scoping review can be found in Appendix A,

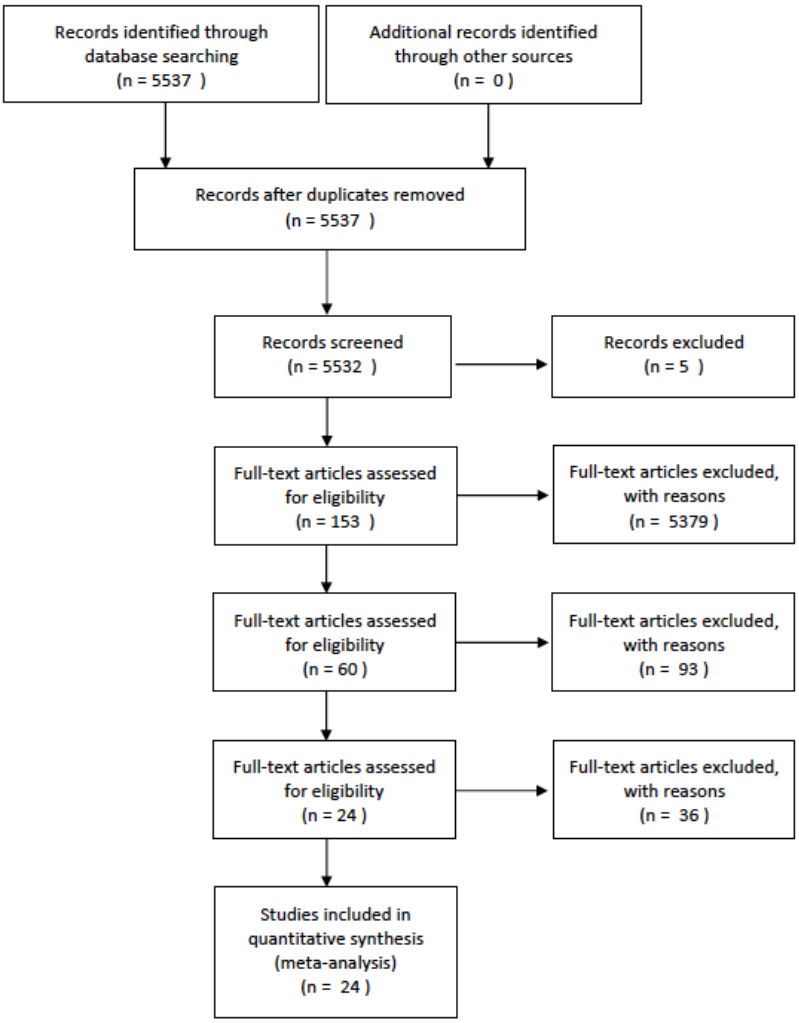


Figure 3.1: Process of identifying primary studies

The process of identifying, synthesizing and categorising the concepts was one that was systematic. The final papers were each critically appraised in order to interpret the data in an unbiased manner. This was done by directing the researcher's attention to all the important aspects in each primary study as suggested by Petticrew and Roberts [61]. Synthesizing the data involved collecting and summarising the results gathered from the primary studies [58]. This then led to the deconstruction and categorisation of the concepts that emerged from the studies. This process involved identifying the main attributes, characteristics and assumptions from the papers and then categorising the concepts based on their ontological, epistemological and methodological roles [27].

3.5 Descriptive analysis

The primary studies were exported into MS Excel, as previously explained. The studies were analysed and coded in MS Excel in order to obtain descriptive data to allow for a deeper understanding into the research. In Figure 3.2 the number of citations of the author(s) of each paper is indicated. This data was obtained from Scopus on the 26th of August 2019. The figure aids in showing the most influential authors in the research fields of value creation, information systems and ecosystems.

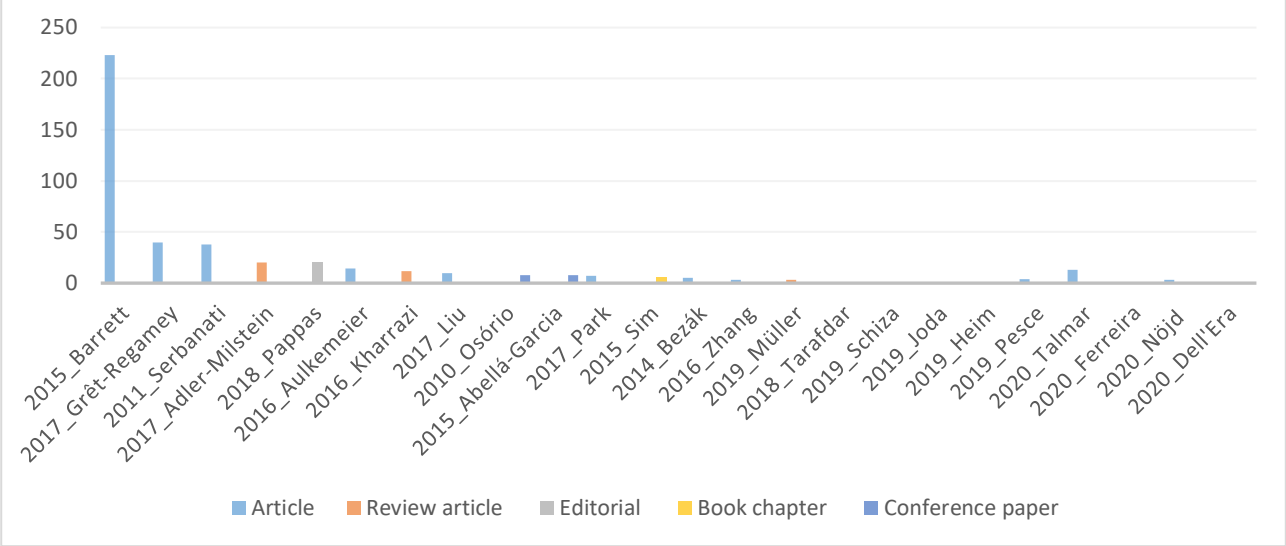


Figure 3.2: Citation count of primary studies

A timeline of the publication dates as seen in Figure 3.3 is also shown in addition to the citation ranking. As seen in the Figure, the first study of the primary studies that were retrieved from the Scopus database was published in 2010. Therefore, even though there are recent publications available regarding the value, information systems and ecosystems, it is imperative that the researcher also focuses on older publications to gain a more comprehensive picture.

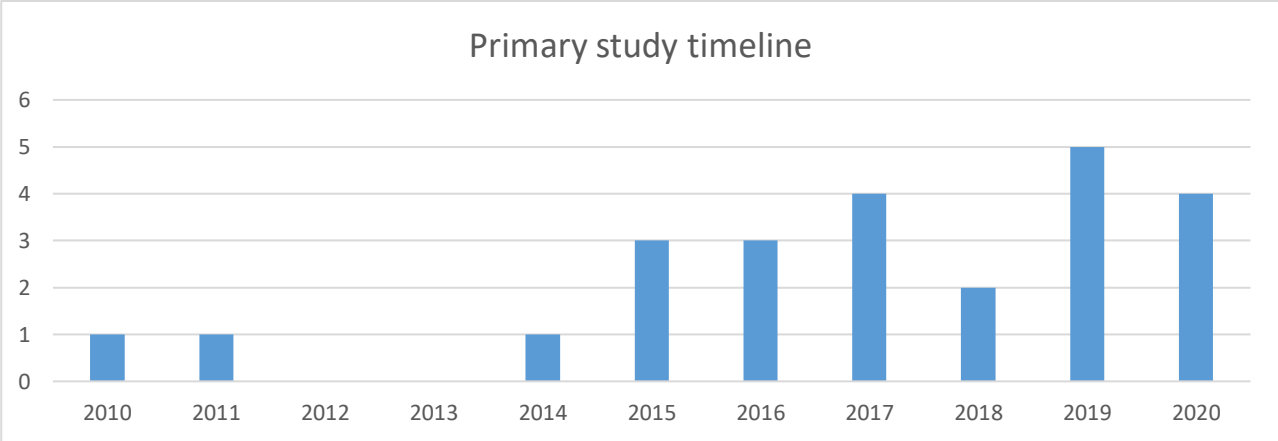


Figure 3.3: Timeline of primary studies

The analysis involved examining the geographical focus of the empirical work for each of the papers. Europe, Asia and North America formed the overarching geographical focus of the primary studies as seen in Figure 3.4. Europe included Italy, Cyprus, North-West Slovakia, The Netherlands and Switzerland. Asia included China and North America included United States. In the figure, the term 'General' indicated that the empirical work of the paper was not country-specific. As can be seen in Figure 3.4 there are no papers that have a specific focus on Africa, which signifies the gap in literature that focuses on value creation that is supported by information systems from an ecosystem perspective in the African or South African context. The void of relevant literature substantiated the need to gain insight into the challenges facing digital systems and their ability to create value in the context of South Africa.

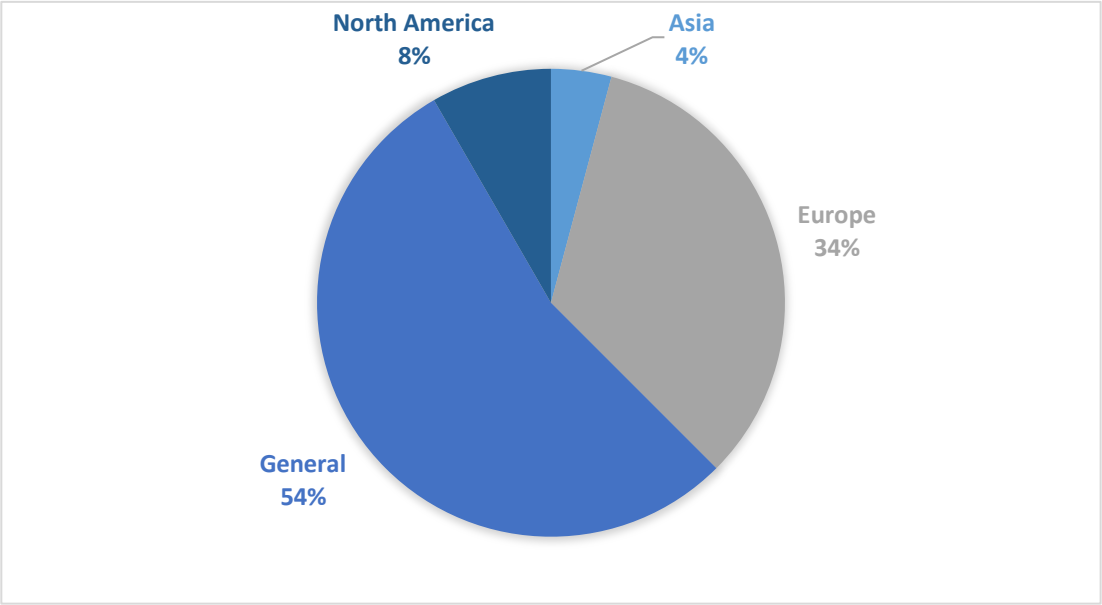


Figure 3.4: Geographical focus of primary studies

The ecosystem perspective formed the basis in which primary studies were identified during the search. From further analysis and coding of the data from the primary studies, diverse definitions of ecosystems arose. The definitions are categorised in Figure 3.5. From the figure it can be seen that the frequently reoccurring ecosystem definitions were the digital healthcare, healthcare and digital ecosystems. The diversity in ecosystem definitions indicated the need gain insight beyond digital and healthcare ecosystem literature. The difference between these ecosystems and what it means for this research is discussed in Section 4.2.

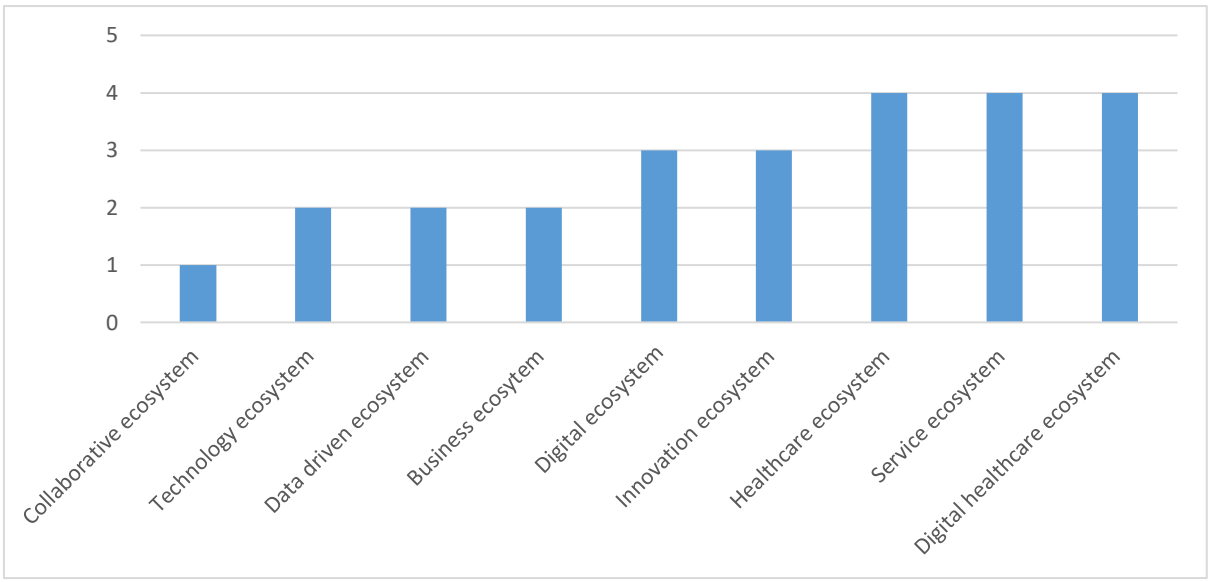


Figure 3.5: Ecosystem types

The unit of analysis that formed the entities studied in each of the ecosystems varied. These entities were grouped into three broad categories as illustrated in Table 3.4. These categories included: the political and economic environment, the organisation and the actors. The description of each of the three entities as well as the respective primary studies that acknowledge each entity, is provided in

Table 3.4. The variation of entities within the ecosystems that were identified indicated the need to investigate each one individually in order to gain insight on how the ecosystem functions as a whole. This was essential to guide the researcher in identifying the elements that needed to be considered in the design of an effective value creation system.

Table 3.4: Unit of analysis within ecosystem

Unit of analysis	Description	Focus	Primary study reference
Political and economic environment	Transform and ultimately influence the structure and performance of the organisation.	Innovation, strategy development, strategy management	[62]- [63], [64]- [65], [66]-[67] [68], [69], [70], [71]
Organisation	A system designed to provide infrastructure and resources to support the interaction and service transaction between actors.	Value-based service, information technology (IT), execution barriers,	[72], [73], [74], [75], [76], [66], [77], [78], [79], [80]
Actors	Interconnected agents who's attributes determine the success of the organisation.	Value creation, collaboration, open innovation	[72], [62], [63], [64], [75], [66], [69], [77],[78],

Identifying the challenges of information systems from an ecosystem perspective concluded the descriptive analysis of the data. It was important to pinpoint the obstacles related to information systems from an ecosystem perspective for the purpose of forming a foundation for future research. Identifying these hurdles in the scoping review guided the researcher to focus on determining how these challenges could be overcome. In Table 3.5, it can be seen that the majority of the challenges that were identified in the primary studies were regarding creating and managing value through data, collaboration and IT.

Table 3.5: Challenges of information systems from an ecosystem perspective

Challenges of information systems and/or their ecosystems	Discipline covered	Reference
Knowing what needs to be done but not knowing the best way to do it in terms of which actions should be pursued by which stakeholders.	Healthcare	[72]
How to represent communities and their value creation in business models.	Human dynamic	[62]
Understanding how an organisation can embrace technology innovations and business shifts.	Innovation	[63]
How organisations can give purpose to data and get value-driven answers to increase their performance.	Innovation	[63]
Developing a standardised format for data capturing in healthcare.	Healthcare	[64], [73]
Accurate recording of data in healthcare.	Healthcare	[72], [73]
Evolving the way organisations within the ecosystem interact, cooperate and collaborate.	Innovation	[63]
Managing co-creative organisations with different ecosystem actors.	Human dynamic	[62]

Involving stakeholders in value-creation processes.	Human dynamic, Nature	[62], [65]
Collaborating and sharing knowledge between healthcare professionals.	Healthcare	[64], [73]
Integrating healthcare systems.	Healthcare	[72]
Lag of interoperability in (electronic health records) EHR management systems.	Healthcare	[64]
Lack of architectures to support pluggable services.	Information systems	[74]
Developing health information technology that is designed to support the transition to value-based care.	Healthcare	[72]
Managing privacy and confidentiality in EHR.	Healthcare	[64]
Motivating stakeholders to accept EHR through culture and education for its success.	Healthcare	[64]
Lack of modern technologies due to insufficient financial resources to invest in ICT equipment and services.	Human dynamic	[75]
Monitoring and learning about the continuously evolving perceptions of the customer.	Human dynamic	[76]

Based on the diverse challenges identified in Table 3.5 it was concluded that the value creation system that is developed in this research study has the potential to be used as a management tool by managers in other ecosystems other than the healthcare ecosystem.

3.6 Conceptual analysis

By reading and rereading the primary studies as suggested by Jabareen [27] the researcher was able to identify and categorise emerging data that related to the research questions. Conceptual insight was derived from these results. This insight is discussed in detail in this section and includes the multidisciplinary research areas covered by the primary studies and the important concepts that are linked to the search terms.

3.6.1 Research areas

The research areas discussed in the primary studies were identified and categorised by the researcher with the intention of highlighting the multiple disciplines covered by the studies. This served to substantiate the fact that one simply cannot conduct such an investigation through one lens. The spectrum of the research areas shown in Table 3.6 indicated that the researcher needed to be aware of other areas of research such as strategic management, business sustainability and service innovation. The table provides descriptions for each of respective research areas and illustrates the categories in which they belong to.

Table 3.6: Disciplines covered by primary studies

Category	Research area	Description	Reference:
Nature	Topography	The translation of scientific knowledge to guide the arrangement of natural and artificial features in a region.	[65], [67], [68], [71]
	Socio-ecology	The integration of social and environmental dimensions to create sustainable communities.	[65], [70], [71]

	Sustainability	Developing strategies of how to co-exist and co-evolve in societies to maintain ecological stability.	[63], [70]
Human dynamic	Social dynamics (looking at ecosystem actors)/collaboration	Understanding the interactions and interrelations of actors in society to gain knowledge in order to innovate and create value.	[63], [66], [68], [72], [75], [77], [78],
	Value co-creation	A collaborative process in which value is created through the interaction between a network of actors.	[62], [75], [76]
Economics	Strategic management	The management of emerging visions and how they can be brought to practice in the future.	[62], [78]
	Business sustainability	The use of scientific methods as the foundation on which social financial and environmental resources are managed and coordinated to ensure success.	[79]
Information system	Service oriented architectures	Innovative patterns used to structure complex infrastructures in order to cope with complex and integrated solutions.	[66], [74]
	Information and communication technology infrastructure	Technological tools used to improve productivity and efficiency of a firm's service delivery processes which can lead to new markets or service streams.	[62] [69]
Healthcare	Health care delivery	Understanding how the health IT ecosystem can meet the goals of modern health care delivery.	[64], [72], [77]
	Patient-centered care	The involvement of the patient in the way that care is provided to the individual by listening and informing the patient to ensure that their needs are met.	[64], [77]
	Value-based care	The delivery of better care that results in a better outcome at a lower cost.	[72]
Innovation	Business innovation	The improvement of existing methods to positively influence business outcomes.	[76]
	Open innovation	The idea of innovation in a business through external communities by taking into account social and ecological viewpoints.	[62]
	Technology innovation	Accelerates transformation and the creation of sustainable societies through collaboration, cooperation and coordination of factors.	[63], [76], [80]
	Service innovation	Arises through service exchanges between providers and customers in order to drive economic development.	[69]

The research areas that were identified were placed in one of the six categories in Table 3.6. Papers focusing on how ecosystems function from an ecological perspective were grouped together under

the nature category. Research areas focusing on: people and their dynamics, business management, healthcare delivery and innovation were categorised into: the human dynamic, economics, healthcare and innovation categories respectively. Since information technology was used as a search term, studies specifically focusing on aspects of information technology were identified and placed into the category.

3.6.2 Important concepts

The concepts that emerged from the primary studies were deemed important based on how frequently they were mentioned across all the studies. Identifying the important concepts in the primary studies resulted in an in-depth comprehension of the workings of information systems, ecosystems and value and how they relate to one another. The concepts were linked and categorised based on their relation to the search terms (value AND information systems AND ecosystems) in Table 3.7. The search terms formed the umbrella under which each of the key concepts were categorised into the respective subcategories. For information systems, these subcategories include interoperability, stakeholder-related, pluggability and sustainability. The Ecosystem subcategory includes resilience, functioning and ecology/natural life. The concepts relating to value were all categorised under the theoretical concepts that need to be considered.

Information systems form an integral role in service innovation within an ecosystem as it introduces new ways to combine and exchange resources in order to create value for the actors involved in the exchange [69]. Information technology accelerates the development of sustainable societies as it improves services and transforms business models [63]. Information systems need standards enforced by a regulating body, to integrate dissimilar systems and to support interactions across networks regardless of the physical and operating systems [64,77]. Throughout the primary studies, three main components were identified as key for information system interoperability. Sustainability of information systems is imperative in order to develop innovative digital data-based designs that transform businesses and drive economic development, leading to greater efficiency and cost reduction [63,69]. Pluggability refers to incorporating quality standards that are a reflection of the external quality criteria for information technology services. These standards are equivalent to reliability, efficiency and/or maintainability [74].

The last subcategory for information systems is the stakeholder-related concepts. These concepts are key since information systems are used by these interconnected actors. The value created by information systems, and therefore its success, is largely dependent on the behaviour, capabilities and needs of the stakeholders, thus it is important to ensure that the information needs and requirements of the stakeholders are satisfied [63]. The key concepts identified for information systems act as a starting point for understanding the fundamental characteristics of how information systems operate.

Table 3.7: Important concepts from primary studies

Search term:	Category:	Key concept:	Description:	Reference(s)
Information systems	Interoperability	Integration	Integration of dissimilar systems to improve wellness, quality, safety and cost-effectiveness.	[64], [66], [74], [81]
		Collaborative networks	An interaction across local/ wide area networks regardless of physical and operating systems.	[64], [66], [76], [77], [80],

		Authority/ authorisation	To create a regulating body that has legal powers to enforce standards in services.	[64]
	Stakeholder-related	Value co-creation	The mediation of technology platforms in stakeholder interactions leads to the creation of value.	[62], [69], [75], [80], [81]
		Usefulness	Supports decision making procedures to ensure delivery of service at point of need.	[64], [77], [73]
		Acceptance/ Adoption	Acceptance of information systems, and therefore its success, largely depends on the mindset and culture of the stakeholders.	[64], [77]
		User information satisfaction	The extent to which the user believes that the information system can meet their information requirements.	[80]
	Pluggability	Quality	Quality standards that are a reflection of the external quality criteria for IT services. These standards are equivalent to reliability, efficiency and/or maintainability.	[74]
	Sustainability	Management information systems	Fosters compliance with documentation standards by ensuring that data is structured, accurate, relevant and complete.	[64], [73], [76]
		Service innovation	Drives economic development and leads to greater efficiency and cost reduction.	[69]
		innovation management	Leads to the development of innovative digital data-based designs that transforms businesses.	[63]
Ecosystem	Resilience	Adaptability	A system that can either return to its original state equilibrium or a system that adapts to a new equilibrium.	[70]
		Actors	Diverse actors that function in different stages when a disturbance in the system occurs.	[70]
		Duality	A system may be resilient in a condition that can be viewed as either positive or negative.	[70]
	Functioning	Actors	A multitude of agents that are interconnected and that	[64], [69], [77]

			integrate resources to co-create value in the ecosystem.	
		Collaboration, cooperation, coopetition	Creates opportunities to address stakeholder needs by developing innovative designs.	[62], [63], [66]
		Innovation	Evolving the way ecosystem actors interact, cooperate and collaborate.	[62], [63]
		Value co-creation	The creation of value through interaction and coproduction of knowledge between different actors in a multiple-stakeholder environment.	[62], [69], [75]
	Ecology/natural life	Biological community	The interaction of living organisms with their nonliving environment.	[63], [77]
Value	Concepts to consider	Data-driven culture	Extracting data that has purpose and meaning in order to give actionable insight to allow decision makers to base their decisions on insight instead of instinct.	[63], [73]
		Dynamic capabilities	Actively integrating stakeholders with varying needs and capabilities to increase value.	[63], [72]
		Learning	Continuously monitoring and learning about the evolving perceptions and needs of stakeholders in order to create value.	[76]
		Communities	Create value through the collaboration of various actors that are bonded together by their competences, relationship, information and shared vision.	[62], [69]

Actors are no longer seen in isolation in the ecosystem, instead all of them actively interact and collaborate through the mediation of information systems to create value [63]. The ecosystem category yields fundamental aspects that need to be considered regarding how information systems function from a holistic perspective. The first subcategory includes concepts that influence the resilience of the ecosystem such as adaptability, actors, and duality. It is important to acknowledge that different actors function at different stages with the system. This ultimately affects the systems adaptability when disturbance in the system occurs. The system adapts to a disturbance by either returning to its original state of equilibrium or adapting to a new equilibrium [70]. The second subcategory is the functioning category focuses on evolving the way in which ecosystem actors interact, cooperate and collaborate in order to create value through interacting and co-producing knowledge in a multiple-stakeholder environment [63], [69], [75]. Ecology forms the final subcategory focuses on biological community which considers the interaction between entities with their environment. Ecology also draws from business ecosystem literature.

According to the primary studies there are several theoretical concepts that need to be considered when it comes to value. These concepts include data-driven culture, dynamic capabilities, learning and communities. In a data-driven culture, value is created by extracting data that has purpose and meaning in order to give actionable insight and to allow actors to base their decisions on insight instead of instinct [63], [73]. These actors are actively integrated with varying needs and capabilities in order to foster collaboration and a bond through competences, relationships, information and shared vision [63], [66], [69], [72]. The evolving perceptions and needs of the actors need to be continuously monitored and learnt to increase this value [76].

While great progress has been made in digitising systems, information technology infrastructures in certain ecosystems, such as healthcare ecosystems, remain largely a collection of dissimilar systems that are not designed to support the transition to value-based services [72]. The concepts discussed in this section served to provide the theoretical concepts that needed to be considered during the development of the research study.

3.7 Limitations of the review

The process of characterising and interpreting the findings from the review were subject to reviewer bias as only one researcher conducted the review. It is therefore acknowledged that there may have been possible bias during the formulation of the scoping review. The review was also limited in regard to the quantity of primary studies retrieved for analysis. As previously mentioned, Scopus was the only database used in the review. This mainly owed to the fact that it is the largest single abstract and indexing database that has been built [60] and therefore could yield an adequate amount of studies to conduct the review.

3.8 Chapter 3 summary

The nature of the scoping review allowed for the primary studies to be identified and examined in a methodical manner. This was achieved through a combination of literature sources that were used to develop a standard scoping review. The review was one that was iterative with new emerging data being constantly compared. The results of the review provided insight that guided the direction of the research study. The conclusions derived from the scoping reviews, that were of particular significance included: (1) the gap in literature in the context of Africa, (2) ecosystem types, (3) unit of analysis of primary studies, (4) the challenges identified regarding information systems and their ecosystems, (5) the multidisciplinary nature of the primary studies and (6) the important concepts that emerged from the studies. These six areas of interest are presented in Figure 3.6

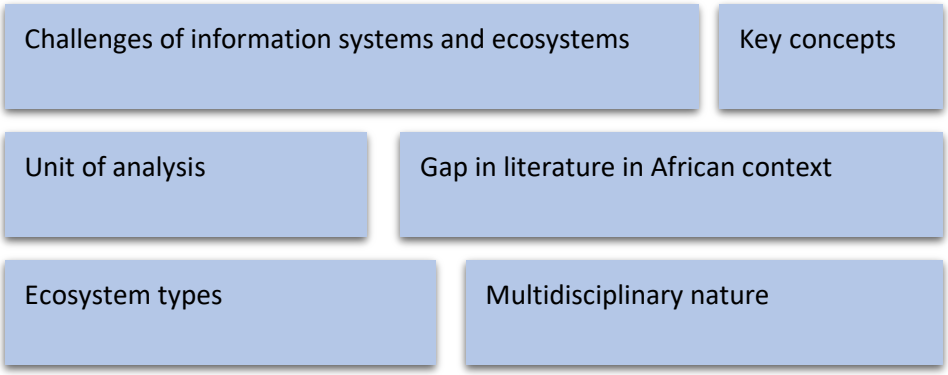


Figure 3.6: Foundation from scoping review

The six areas of interest derived from the scoping review form the foundation on which further research was built and were used to guide the development of the framework. In Figure 3.6, the blocks referring to the challenges, key concepts, unit of analysis and ecosystem types substantiated the need to look at value creation that is enabled by information systems within an ecosystem through multiple lenses when developing the framework. Furthermore, the block referring to the gap

in literature in the African context, indicated the need for the researcher to provide a branch of knowledge that would contribute to filling this void. The chapter that follows discusses and further investigates this foundation of literature in more detail.

Chapter 4: **Conceptual literature review**

4.1 Introduction

This chapter consists of a conceptual literature review which provides an overview of the fundamental concepts identified in the scoping review, presented in the previous chapter. These concepts necessitated further investigation to gain a deeper and richer understanding prior to the development of the framework. The chapter commences with a breakdown of ecosystem literature and how it relates to the research. This is then followed by an overview of information systems and their role within an organisation. The dynamics of the value creation concept, within an ecosystem context, is then discussed. This investigation provides an understanding of the core characteristics of ecosystems, information systems and value creation which helped to inform the development of the framework in Chapter 5. This chapter also gives an overview of identified frameworks, models and tools that already exist in literature to further inform the development of the framework. The aim was to identify an appropriate structural approach for the design, development and implementation of the value creation system. The process used to identify these frameworks, models and tools was similar to the proceedings in the scoping review in Chapter 3.

Chapter 4 objectives:

- Provide an in-depth review of ecosystem literature
- Discuss the connection of ecosystem literature to the research
- Define information systems
- Explore the complexity and characteristics of value logic
- Describe the dynamics of stakeholder theory
- Investigate existing frameworks, models and tools that can be used to guide the development of the framework
- Develop criteria to use to select and evaluate the identified frameworks, models and tools
- Analyse the selected frameworks, models or tools to gain insight that can be used to develop the final framework

4.2 Ecosystems

The ecosystem is a metaphorical approach that has become progressively used in both research and in practice. The approach is one that uses natural ecosystems to understand complex business networks that are interconnected and operate around a focal firm or a platform [21]. In this way the approach provides a new way of looking at a business' structure, interactions and exchanges. The approach achieves this by shifting the analysis of a business' network to the system level by focusing on the relations, interactions and dynamics of the massively interconnected organisations, technologies, and actors [22]. The attractiveness of this metaphor and the driving force behind selecting the ecosystem perspective for this study lies in its ability to provide a lens that focuses on self-organisation, coevolution, adaptation and co-creation of value [21], [82]. The metaphor achieves this by driving business research to transcend the atomistic and internal view of the business [22].

While there is little doubt that the metaphor has increased the understanding of business networks and promoted creative thinking in the field, there is a "danger" that is associated with using the natural/biological ecosystem as an analogy. This largely stems from how the natural ecosystem is narrowly defined, ambiguously used and how it does not consider critical characteristics such as innovation, competition for members and intelligent actors that business networks consider [22], [83]. This therefore brings into question whether or not the metaphor is appropriate. Literature suggests that the metaphor cannot be wrong or inaccurate, and can only be considered to be useful or not useful. The usefulness of the metaphor is dependent on its contribution to the real world [22].

The ‘ecosystem’ term has grown in its ecological meaning and has helped raise awareness on new models of value creation and value capture [84], [85]. Two views that have helped to conceptualise these models in the ecosystem context include: Ecosystem-as-affiliation and ecosystem-as-structure. The ecosystem-as-affiliation realm is a strategy that views ecosystems as a community of interconnected actors, technologies and institutions that are defined by their network and platform affiliations [84], [85]. The strategy offers an appealing metaphor that is helpful for the description of interactions and links between actors at the macro level. The ecosystem-as-affiliation perspective however is limited in its ability to provide a comprehensive understanding of value creation. This is mainly due to its focuses on general governance and community enhancements. The alternative perspective, the ecosystem-as-structure, offers an approach that considers interdependent value creation. The approach starts with a value proposition which is linked to a business model that focuses on achieving sustainable development and offering for long term solutions for multiple stakeholders [86]. he approach obtains a constellation of stakeholders that need to interact in order for the value proposition to come to a realisation [85], [87].

There are several definitions and perspectives that have been adopted across different ecosystems. The following sections discuss the different types of ecosystems that were identified in Section 3.5. These ecosystems include the biological ecosystem, digital ecosystem, innovation ecosystem, business ecosystem, collaborative ecosystem and data-driven ecosystem respectively. Table 4.1 provides a summary of the key actors, typical properties and the core strategies for each ecosystem type. The main purpose of the sections that follow and Table 4.1 was to provide an in-depth discussion and analysis of the each of the ecosystems in order to inform the research. This was done through gaining different learnings that could be of value and impact in healthcare and digital healthcare ecosystems. The researcher acknowledges the fact that these ecosystems are not independent of one another and in fact depend on one another for their success.

Table 4.1: Summary of the different ecosystem types

Ecosystem type	Key actors	Commonly referenced properties of the ecosystem	Core strategic action	References
Biological ecosystem	Biotic factors: flora and fauna	self-organising, scalability and sustainability	Maintain an equilibrium state within the ecosystem which has a dynamic complex function	[88], [89]
Digital ecosystem	Primary actors, digital technologies, networks, organisation	A combination of complex production and consumption ecosystems, software systems are part of the ecosystem, agent environment, self-organising	Transform traditional businesses and their processes by embracing new digital technologies in order to make incremental changes in said spaces	[90], [91]
Innovation ecosystem	Human capital: a set of individuals who contribute to and generate existing or new knowledge and innovations,	Value creation through successful innovation, knowledge creation, transformation of knowledge into innovation	Enable innovation through the production of new knowledge and technologies and in turn capture the returns from innovation	[92], [93], [88]

	material resources			
Business ecosystem	Organisations, human actors, human networks	Symbiotic relationships between and within organisations, complex networks formed through interactions, mutual dependence of actors, life cycles across networks of products, industries and technologies	Understand the networked economy that evolve around the business in order to find ways to contribute to it to enable the business ecosystem to grow and prosper in the long run	[92], [94], [95], [22],
Collaborative ecosystem	Communities, other stakeholders, networks	Joint decision making, stakeholder involvement, stakeholder and community empowerment, participation incentives	Create an integrated balance amongst social, economic and ecological goals through collaborative approaches	[96], [97]
Data driven ecosystem	Complex networks, primary actors, data, platforms	socio-technical networks, collaboration of autonomous actors, value creation and value delivery, environment for creating, managing and sustaining data,	Use and exploration of data through the collaborative networks to foster innovation, create value and support organisations	[94], [98], [99]

4.2.1 Biological/natural ecosystem

The ecosystem concept is firstly discussed in this research in the biological sense before proceeding to discuss other ecosystems. This is mainly because the biological ecosystem is often used as an analogy that conceptualises behavior within other ecosystem networks. The value of the ecological metaphor is recognised by managers and academics for understanding the complex network of business relationships within and across industries [22]. The biological ecosystem is said to be a complex set of relationships that exist amongst a community of living organisms, the environment in which they inhabit and the interactions between the organisms [88], [92]. The goal within such an ecosystem is to maintain a sustaining equilibrium state which maintains the population. Certain functions are carried out within the ecosystem, in addition with the ecosystem's functional characteristics, in order to maintain this desired equilibrium [88]. The biological ecosystem hence has specific features that are important for understanding business networks such as structure, the relationship among the participants, the kind of connections among them and the different roles played by the participants. [22].

4.2.2 Digital ecosystem

Digital technologies are changing the way businesses operate by revolutionising traditional interdependent networks that connect entities within the business [90]. Managers for this reason have started to recognise their business environments as digital ecosystems. This effort is referred to as digital transformation. Digitisation has compelled Managers to not only adopt the ecosystem perspective as a means to improve efficiency but to also use it as a pathway for growth. Digital ecosystems are powered by digital technologies which are far more expansive with their reach than traditional value chains and industry structures. Through digital ecosystems, conventional products, services and underlying value chains can expand in their scope and discover new opportunities to

create and deliver value. Digital ecosystems are open communities where leadership structures are formed and also dissolved in response to the dynamic needs of the environment. Digital ecosystems unlike other ecosystems are self-organising and can form different architectural models that facilitate interactions between entities that determine the overall behavior [91]. Digital ecosystems are inspired by biological ecosystems, however, several features of the biological ecosystem have not yet been fully explored. Mimicking and exploiting these properties can result in robust, scalable, and self-organising digital ecosystems [89].

4.2.3 Innovation ecosystem

The influence that innovation has had on economic growth has increased with the flourish of Information Communication Technologies. The creation of innovation is dependent not only on technology and investments but also on institutional and cultural factors [92]. The innovation does not stand alone; it relies on the accompanying external changes in a firm's environment which embed the firm within an ecosystem of interdependent innovations [93]. The innovation ecosystem is defined as being the complex relationships that are formed between actors whose functional goal is to enable technological development and innovation [100]. These actors that make up the institutional entities in the ecosystem include material resources and human capital [88]. The innovation ecosystem consists of two distinct but largely separated economies which include the research economy which is driven by fundamental research and the commercial economy which is driven by the marketplace [88]. To understand the performance of the firm in such 'innovation ecosystems' requires a change in the way in which the industry dynamic has been traditionally linked to a firm's performance. In addition, an approach that is explicit about innovation challenges that different actors within the ecosystem need to overcome in order for value to be created is required [93].

4.2.4 Business ecosystems

Business ecosystems consist of heterogeneous and continuously ever-changing sets of individuals and firms that are interconnected through an intricate, global network of relationships. These firms come from diverse market segments that each provide unique value [94]. The business ecosystem perspective offers a new way of obtaining a holistic view of the service network and the relationships and mechanisms that shape it, while taking into account the roles and strategies of the individual actors that form part of the network [22]. The service network is a loosely coupled system that requires interoperability and extensibility to satisfy sufficient protocols for interaction and leveraging [22]. The concept of business ecosystems enriches studies of service networks by considering firms as interconnected parts of a larger environment, emphasizing the role of the individual firm and by highlighting the importance of the health of the system, in which the firm is rooted in, as a collective [22].

The business ecosystem term was initially used by Moore [101] and was later developed by several other researchers such as Iansiti and Levien [102] who contributed different focus points and approaches [22]. Moore [101] defines business ecosystems as being "*an economic community supported by a foundation of interacting organisations and individuals – the organisms of the business world*". Iansiti and Levien [102] do not pay much attention to defining the business ecosystem the way Moore [101] does but rather develop a perspective to understand business networks. The biological ecosystem was used by Iansiti and Levien as an analogy to conceptualise business networks. They believe that these ecosystems have specific features that are important for understanding business networks [22]. Iansiti and Levien do however also realise the danger of using analogies from biological ecosystems to understand business networks as business networks have characteristics that biological ecosystems don't have, such as innovation, competition for members, and intelligent actors [22]. Several characteristics found from Moore [101] and Iansiti and Levien [102] propose that business ecosystems offer a different perspective from the more traditional strategic management network perspective [22]:

1. It emphasizes that networks can be a source of firm renewal rather than an external threat which is often the focus of other existing frameworks.

2. It examines the relationships between firms in the business network and defines the roles that can be played by the firms and the strategies that can be followed to maintain the health and performance. The traditional network perspective focuses more on the interactions of the network participants and less on the roles played and the strategies followed.
3. It recognises the importance of both cooperative and competitive relationships and their interplays for the survival of the firms and their networks.

Ecosystem health is a concept that provides information regarding a system's longevity and propensity for growth in a business ecosystem [95]. The "health" of a business ecosystem is a performance indicator introduced by Iansiti and Levien [102]. According to them, there are three metrics of ecosystem health which include robustness, productivity and niche creation [95]. If an ecosystem is healthy, it should be able to maintain high levels of robustness in order to maintain a relatively stable environment that can face and survive disruptions. The productivity of a business is measured to gain insight on how efficiently the inputs of the business are converted into outputs. A healthy ecosystem should also create new meaningful and diverse niches to maintain good health [95].

4.2.5 Collaborative ecosystems

Holistic multidisciplinary approaches are being adopted in many disciplines as there is a belief that social, cultural and economic systems are intertwined [96]. Within collaborative ecosystems, a balance between these systems and their goals is sought after to prevent the dominance of one system at the expense of others. Collaboration plays an integral role here as it allows for joint decision making through consensus-based approaches. Stakeholders are empowered through these collaborative processes as they go beyond just public involvement and instead give stakeholders a sense of responsibility and even govern their actions to ensure that established goals are met [96]. Stakeholder concerns and interests are represented within such ecosystems for the purpose of guiding these decision making spaces. The purpose of collaborative ecosystems isn't solely to facilitate a balance between stakeholder interest but it is also to attain personal and institutional capacity to ensure that the best solutions are developed in an efficient manner [97].

Ideally, the process of collaboration isn't bound by time and is instead an ongoing process through implementation and monitoring. There are eight factors that are essential for integrative and collaborative ecosystems which are necessary for their management. These factors include: integrated and balanced goals, inclusive public involvement, stakeholder influence, consensus group approach, collaborative stewardship, monitoring and adaptive management, multidisciplinary data, and economic incentives [96].

4.2.6 Data-driven ecosystems

Data ecosystems are defined as being complex socio-technical networks that permit the collaboration between independent actors in order to explore data [98]. Such ecosystems provide an environment for creating, managing and sustaining data sharing initiatives. In the data ecosystem, the actors are considered to be autonomous entities such as enterprises, institutions or individuals who each have a specific role in the ecosystem and are connected to one another by a set of interests or business models [98].

Data ecosystems from part of various types of ecosystems that are organised around businesses resources and products. This is mainly due to the increased recognition of the importance of data within these ecosystems. Data provides multiple benefits that include: business support, innovation delivery and transparency [98], [103]. However, despite this emerging interest in data usage, the basic model for the provision and usage of data is said to be a 'one-way street' with no feedback loop between the users and the data providers [98]. Data ecosystems unlock the potential benefits of data sharing by encouraging data users and data providers to collaborate. Here, participating users and data providers share data through platforms such as services, tools and technologies to

generate these benefits [103]. The value that is derived from sharing data includes monetary, social, informational, entertainment and identity values [99].

4.3 Information systems

In order to survive and compete in the global economy, organisations need to create and disseminate up-to-date and useful information and knowledge [104]. This comes as result of Information sharing becoming an important feature within and among organisations due to value creating factors shifting from physical and financial assets towards intangible assets [65]. Information is considered to be an asset which when shared does not diminish as it is used and instead increases in depth and value [104]. Knowledge to an extent is information in the context of something and can be classified into two types, explicit knowledge and tacit knowledge. Explicit knowledge can be easily transferred between individuals and is primarily expressed in numbers, words, charts and formulas. Tacit knowledge on the other hand is a lot more difficult to transfer between individuals as it based on personal experience [105].

An information system is a body of knowledge that is concerned with how an organisation organises its resources in a manner that allows for problems to be identified and for solutions to be designed [105]. Information systems are composed of five key sub-areas which include: (1) Information system development, acquisition and support; (2) people and organisations; (3) information and communication technology; (4) operations and network management; and (5) information and knowledge, customer satisfaction and business performance [106].

Information systems address the interplay amongst business strategies, information technology strategies, and the infrastructure of both the organisation and the information system itself. This interplay is crucial as information systems are considered to be enablers of business strategies and organisational infrastructures [107]. Information systems are therefore not primarily technological the way information technology is but instead involve an understanding of operational business plans and strategies as well as associated information technology issues [107]. Information systems lie within the organisational space that is between the relatively non-technical managers and employees, and the very technical employees and outside developers of information technology [108]. Figure 4.1 illustrates the essential alignment between business and information technology strategies as well as the alignment between the organisational infrastructure and the information system infrastructure. As can been seen in Figure 4.1, information technology and information systems play different roles within a business. Understanding this distinction is important to understand their roles in the value creation process [108].

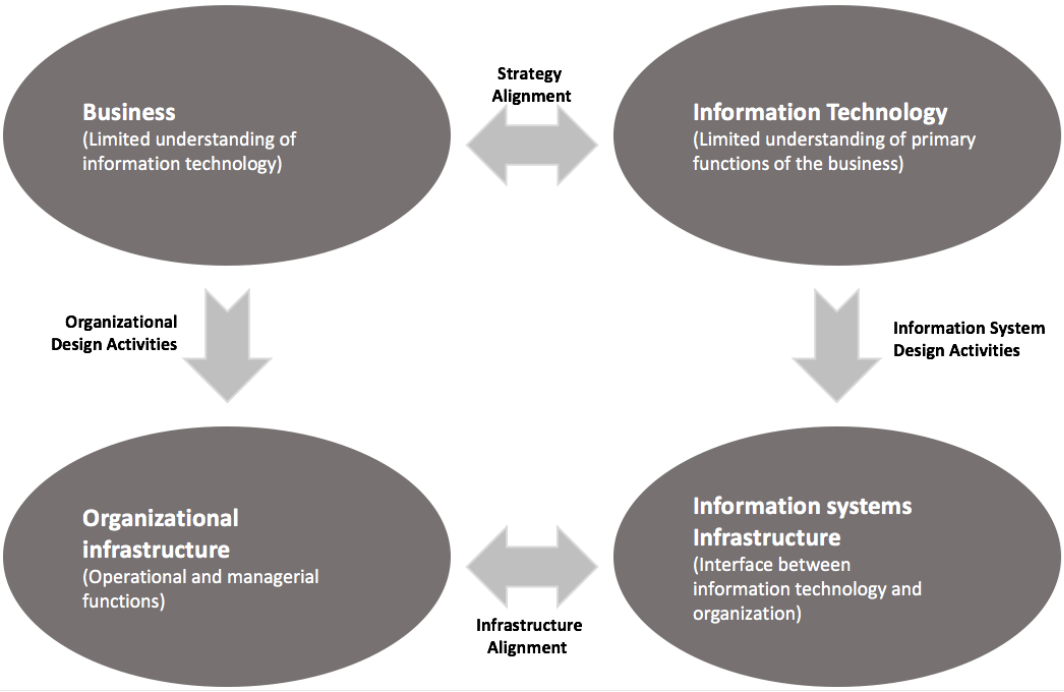


Figure 4.1: The different roles of information technology and information systems [61], [104]

Information systems offer value to managers, decision makers, and other information users [106]. However, the way in which organisations create this value through the use of information systems has been a perennial question in research since the 1960s [109]. From previous literature regarding information systems and organisational value, it is known that (1) Value created from IT is synergistically coupled with other organisational development processes. (2) IT based value exists in many different forms within an organisation which include: increased productivity, process improvement and innovation to name a few [106], [109]. (3) IT based value is created at various levels within an organisation which include the individual level, organisational level and industry level. (4) IT based value emerges from the relationship between IT inputs and an organisation's economic outcomes [109]. Although prior literature has explored the role of information systems in organisations from multiple perspectives, there is still confusion about how information systems create value in cooperation with multiple parties [108], [109]. The investigation of how value emerges from the co-creation activities between stakeholders through IT is an under-explored area in IS research. This presents the need to add to literature by providing a deeper understanding of how information systems facilitate and contribute to value creation in multi-actor services processes [109].

4.4 Understanding value creation and information systems from an ecosystem perspective

There are three key defining characteristics of an ecosystem that provide a framework to better understand ecosystems and also serve to set the boundaries for the ecosystem construct [21]. The first characteristic is the importance of the value logic, in particular the source of value and how it is created. The second characteristic is the symbiotic relations of stakeholders in the ecosystem, as each stakeholder provides specialized and complementary inputs for value creation and co-evolve to maintain the stability and health of the ecosystem. The last characteristic is the institutional stability within an ecosystem in which a locus of coordination is established to provide structure for the operation of governance mechanisms that coordinate the ecosystem [21], [108]. In the following sections we now further discuss the concepts of value logic, stakeholder symbiosis and institutional stability.

4.4.1 Value logic

Value has been studied from a variety of different perspectives however it is still an ill-defined concept due to there being little consensus of what 'value' means and how it can be defined [21]. Several attempts have been made to create a holistic conceptualisation of value. These conceptualisations include defining value as: (1) the amount that a consumer is willing to pay for a firm's offerings; and (2) the properties of the products or services that provide benefits to the consumer [110,111]. These conceptualisations are traditional ideologies of value and are grounded in the conventions and models of an industrial economy. The concept of value has also grown to include new ideologies that consider the value creating system itself. This ideology suggests understanding the boundaries of value logic by including the phenomenological, co-creation, multidimensional and emergent characteristics of value as these are key components of the construct [23], [112]. Recognizing the phenomenological nature of value is important as value is perceived and experienced differently by different actors in varying contexts. It is also important to consider the co-creation of value which looks at value as being generated from the interactions of stakeholders within the ecosystem [21], [23]. Placing emphasis on the phenomenological and the co-creation aspects of value necessitates the need to highlight the multidimensional construct of value. This multidimensional construct considers value to be made up of various components which include individual, social, technological and cultural components. The emergent property of value is temporal and contextual in its manner and is based on the interactions that occur between actors. Based on these four characteristics, value is no longer one-dimensional objective of economic growth but it rather constitutes a multitude of various factors that need to be considered [23], [113]. The two ideologies of value are presented in Figure 4.2. The four characteristics of value are grouped based on their relatedness and discussed in more depth in the sections that follow.

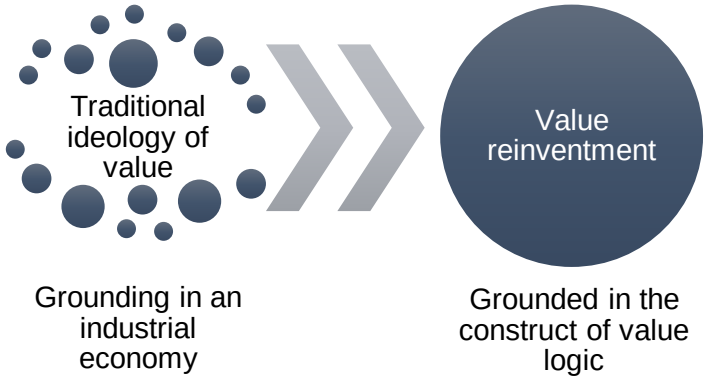


Figure 4.2: Conceptualisations of value [108,109]

4.4.1.1 Sources of value

Defining value is essential in order to understand the performance of an organisation and to drive continuous improvement [21]. Rigorous and disciplined measurement and the improvement of value is therefore necessary to drive system progress [11]. Value reflects the varying interests of multiple stakeholders within an ecosystem, and therefore recognizing the role and relevance of multiple stakeholders in the value creation process is imperative as stakeholders' perception of value differs [113]. In this sense, value is always uniquely determined by stakeholders. Stakeholders' perception of value can be associated with four factors. These factors include: 1) goods and services, 2) organisational justice, 3) organisational affiliation and 4) perceived opportunity costs [114]. These factors have been identified in literature to be important to stakeholders and are broad enough to incorporate what stakeholders seek when they interact with an organisation. Value that is associated with physical goods and services is perhaps the most common source of value for stakeholder. It considers the perceived value of the goods and services provided by an organisation. Value that is associated with organisational justice relates to the fair treatment of different stakeholder groups. This is important to consider as the way one stakeholder group is treated influences the relationship

with the other stakeholder groups. Value that is associated with organisational affiliation occurs in part through the benefits that stakeholders obtain from their affiliation with the organisation. Finally, value that is associated with perceived opportunity costs considers whether or not stakeholders are getting what they expected from the organisation [114].

Sources of value are also considered in the manner in which transactions are enabled and includes technical, economic, service and social elements that form a framework for the improvement of an organisation's performance [11]. There are unique and interdependent factors which include flexibility, efficiency and innovation that govern and henceforth act as drivers for value creation [11], [115], [116]. Flexibility, efficiency and innovation form sources of value within the ecosystem. Flexibility, which is related to the ecosystem's ability to be able to respond to systemic challenges and opportunities, is realised through the co-specialization and synergistic interactions between ecosystem participants [21]. In regard to efficiency, value is echoed through transactions in the form of cost or exchange perspectives. Efficiency is key for interlinking activities and leveraging resources [21]. Value emerges from Innovation through a novel combination of resources and services that lead to new products. Innovation not only is a source of value but is also a source of differentiation which provides organisations with a competitive advantage [117]. To achieve the benefits of innovation, investments need to be made to create new knowledge and explore alternative architectures [21]. Innovation together with flexibility and efficiency are dependent on one another to enhance the effectiveness of the individual value driver. This interdependency is what provides the basis for differing ecosystem dynamics [21].

Due to the multidimensional nature of value, the research extends the context of these factors and considers the contribution and influence that each factor has in the creation of value that can sustain the ecosystem [23].

4.4.1.2 Value creation

Value is grounded in the fundamental premises of its co-creation and emergence. The process of value creation is interactive and collaborative as multiple actors or service system entities are involved. The value co-creation concept is one that embodies a configuration of entities which include: people, information, and technology [118]. The perspective of a service a as system of entities, as opposed to a singular entity level perspective which focuses on the customer or the provider only, provides more explanatory power when it comes to value co-creation [118]. Understanding this logic is therefore vital to become and remain competitive [116].

In this research, the "service system" is termed an ecosystem and will be referred to as such going forth in this discussion.

It is important to understand that an ecosystem doesn't necessarily lead to value creation, it only provides the opportunity to do so. Value creation is largely dependent on how the participants behave and pursue opportunities with other participants in the ecosystem that leads to success [112]. The performance of the ecosystem is therefore dependent on the ability of these participants to co-create value [118]. There are different forms of value that emerge for different actors through different processes when it comes to 'value' 'co' and 'creation' [112]. Despite understanding the more active role of the participant and the nature of value, the theoretical discussion consists of more controversial characteristics as focus shifts from value creation toward value co-creation [119]. Value creation refers to a consumer's creation of value-in-use, where value emerges for the user during a good or service activity; value co-creation however is a function of interactions between ecosystem actors [119].

Successful value co-creation requires ecosystem actors to be able to interact with one another through the exchange and integration of resources within the context of their own reality [118]. Interactions are direct and indirect dialogical processes which involve various actors merging

together for the purpose of exchanging resources. Different forms of value creation and co-creation can emerge depending on whether the process is direct or indirect [111], [120]. Direct interactions are active and coordinated processes that take place in any type of process where the customer interacts with the provider's resources in a dialogical manner [81], [111]. Indirect interactions refer to situations in which the customer 'interacts' with or consumes resources that are outputs of the provider's processes [111]. Therefore, in the service context, once the direct interaction has ended, the customer interacts with the outcome of the service process. In regard to direct interactions, it is important to note that the provider's engagement with the customer may influence the value creation process of the customer either positively or negatively or in some cases have no influence at all [111]. The interactive value formation process that occurs when the customer and provider are jointly involved may be a creative but also a destructive process, which is why the quality of the interactions is fundamental for value creation [111].

In literature, spheres are used to categorise actors based on their actions which in turn determines whether the interaction between participating actors are direct or indirect. The role of an actor in the value creation and co-creation process is therefore dependent on a 'sphere' in which potential and real value is created [111]. These spheres include the provider sphere, the joint sphere and the customer sphere and are presented in Table 4.2. It is important to note that this table presents a simplification of reality, as the boundaries between direct and indirect interactions are not always clear-cut. In the table it can be seen that actors in the provider sphere are considered to be value facilitators as they provide potential value-in-use by producing resources and processes for customer use. In the joint sphere, the customer acts as both a co-producer of value as well as co-creator of value jointly with the firm through direct interactions between the actors. In the rest of the customer sphere, which is closed off to the provider sphere, value is created by the customer as value-in-use independently from the provider [111]. The value creation and co-creation process is not one that is linear as value can be created in different spheres at different points in time reflecting spatial heterogeneity. Different value creation patterns may form with value spheres being followed in varying sequences [111].

Table 4.2: Direct and indirect interactions within value creation spheres [109]

	Provider sphere	Joint sphere		Customer sphere	
Actor	Provider	Provider	Customer	Customer (Individually)	Customer (Collectively)
Value	Potential value-in use	Value-in-use		Value-in-use	
Interaction	Indirect interaction	Direct interaction		Indirect interaction	
Process	Value facilitation	Value co-creation	Value co-creation/ Value creation	Independent value creation	Independent value co-creation
Value creation	Value creation is facilitated by the provider through resources/ processes that the customer experiences in the customer sphere	The provider's resources/ processes interact with the customer in a dialogical process	The customer resources/ processes interacts with the provider's resources/ processes in a merged dialogical process	The customer interacts with the output of the provider's processes independently in a value creation process	Other actors/activities/ resources interact with the customer in a collective/social setting for value co-creation that is independent of the provider

The value creation and co-creation that emerges from these interactions is complicated and extends beyond the visible service context of the ecosystem within which it occurs [111]. In addition, this simplified description of interactions between actors is only limited to human actors and ignores the impact of technology and information [111]. ICTs have substantially transformed the way in which ecosystems operate and therefore requires the need to be taken into consideration when attempting to explore value co-creation [118]. Information and communication technology enabled environments contain artifacts, interfaces, processes and people that form a platform on which these interactions take place [121]. A further motivator for its inclusion as an actor within an ecosystem lies in how information-intensive interactions have become [121]. Therefore, technology-mediated exchanges and how they facilitate value co-creation need to be explored due to the connection between interactions, value co-creation and ICTs [122].

Approaches derived from literature, which are linked to technology, suggest that there are diverse variables that influence value co-creation that can result in different innovation outputs [118], [122]. These approaches include research streams that focus on (1) the technology itself, (2) the role of knowledge in service exchanges, and (3) the role of social dimensions. From the technology-driven approach, which includes ICT tools and platforms, value is said to be co-created directly as a result of the implementation of these tools and platforms [122]. The technical adequacy of the technology does influence the value co-creation process. Technical adequacy includes transparency, accessibility and adaptability. In regard to the knowledge-driven approach, the presence of ICT tools and platforms does not imply automatic value co-creation but only provides the opportunity for it to occur. Here, human interactions and resource integration are necessary components needed for value co-creation. The social approach emphasises the role of context-based variables in value co-creation. These variables which include rules, power relations, and conventions can model value co-creation process and encourage the use of technology; and are said to be both drivers of value co-creation and outcomes of value co-created exchanges [118], [122]. These approaches are explored in the research study in line with the ecosystem-based view with emphasis placed on the knowledge-driven and social approaches.

4.4.2 Stakeholders symbiosis

There is a difference of opinion over who or what exactly a stakeholder is. This debate in literature is partly due to the issue of defining what constitutes a legitimate stake [121]. The word ‘stakeholder’ originates from the seventeenth century, where it was used to describe a third party entrusted with the stakes of a bet [16]. This concept of a stakeholder has formed the grounds on which many definitions of a stakeholder have built on. Literature proposes a narrow and instrumental definition of stakeholders as being a group of individuals who without their support the organisation would cease to exist [16]. Broader and more normative definitions also exist that view stakeholders as being an entity that is affected by the performance of the organisation [16]. For the purpose of this research, a combined definition is considered that views a stakeholder as *“any group or individual who can affect or is affected by the achievement of the organisation’s objectives”* [16]. This definition however is adapted by replacing “achievement of the organisation’s objectives” with “creating, maintaining, or extending a symbiosis” [123]. This is owed to the fact that central to most interpretations of the theory of stakeholders is the idea that stakeholders are interdependent and have the ability to forge symbiotic relationships, and therefore have a ‘stake’ in a symbiosis [123]. Literature suggests that this adaptation in the definition is essential as the future of business leadership is likely to depend on a collaborative approach that involves the inclusion and cooperation with various stakeholder groups [123], [124]. The symbiosis concept is therefore explored in this research due to its collaborative properties that allows for traditionally separate actors to collaborate for the purpose of gaining a competitive advantage [124].

4.4.2.1 Stakeholder analysis

The analysis of stakeholders through developed approaches has become increasingly popular in management, development and health policy fields [125]. This is largely due to the growing realisation of their potential and ability to affect the success of an organisation [123]. The analysis is therefore done to understand their interests and the magnitude of their influence so as to determine how they can potentially support or threaten the performance of the firm [16], [123]. Stakeholder analysis is viewed as a way of generating information on "relevant actors" for the purpose of understanding their behavior, agendas and influence on decision-making processes [16]. The stakeholder analysis process recognises these groups and examines them using an approach that consists of three levels. These levels include: (1) the identification of stakeholders; (2) prioritising stakeholders in the order of power; and (3) investigating the relationships between the stakeholders [16], [123]. Table 4.3 clarifies these levels by providing the objective and description of each level.

Table 4.3: Stakeholder analysis levels [15,121,124]

Stakeholder analysis level	Objective of level	Description
Level 1: Stakeholder identification	To identify individuals/ groups of individuals that hold a stake in the phenomenon under investigation.	An iterative process that consists of varying methods to identify relevant stakeholders. Methods include: scoping interviews, focus groups, self-selection, written records and census data. Additional stakeholders are added with the continuation of the analysis.
Level 2: Prioritisation	Classifying stakeholders according to their respective level of importance.	A qualitative approach used to prioritise core stakeholders who principally affect or are affected by the phenomenon under investigation.
Level 3: Investigation of relationship	To map the varying relationships between stakeholders and to understand the potential to develop alliances.	A network analysis used to understand the influence of the relationship between the stakeholder and the organisation to engage in actions that enable stakeholder demands to be met.

A central premise underlying stakeholder analysis is to (1) shape stakeholder networks; (2) improve management and performance of an organisation; and (3) cope with uncertainties facing organisations [125]. The use of a structured approach, such as the one presented in Table 4.3, to conduct the stakeholder analysis is useful to retain a critical stance in the process to achieve these desired goals [125]. It is important to note that It is often impossible to include all stakeholders and a line needs to be drawn at some point based on predefined criteria categorised under the three levels presented in Table 4.3. The process begins with identifying stakeholders based on three prominent features which include: (1) stakeholder interdependence, (2) stakeholders affecting/being affected by the organisation, and (3) stakeholder interest or right in the organisation [16], [126]. The spectrum of stakeholders needs to then be prioritised as simultaneously dealing with all of them and attempting to meet all the needs of all stakeholders is not feasible [16], [127]. Stakeholders can be prioritised based on their interests, positions, alliances and influence [125]. Identifying groups that need the greatest attention does however raise questions of whether or not efforts are correctly made to ensure sustainability and success [127]. It is important to remember that no stakeholder stands alone as the stakes of each stakeholder group are multi-faceted and innately connected [127]. The analysis concludes with an investigation of the relationships amongst stakeholders and between stakeholders and the organisation. These relationships form the basis for long term interdependencies and can be used by organisations to build collaborations and thereby foster a desirable environment [125].

In line with the concept of stakeholder relationships, literature explains that mutual relational influences exist between stakeholders and organisations where there is a capacity and strategy to do so [128]. A distinction exists between organisational- and individual-level interactions and how they interact with one another in collaborative relationships [126], [127]. The relationship between an organisation and its stakeholders is generally dyadic and mutually independent in nature [129]. Based on the type of interaction with the organisation, stakeholder groups are divided into two groups which include the primary group which consists of formal or official contractual relationships with the organisation, and the secondary group which considers those not holding such contracts such as governments and the local community [127]. In this way, organisations therefore consist of a network of explicit and implicit relationships that span both the internal and external environment [127].

4.4.2.2 Understanding the nature of interrelationships between stakeholders

Complex networks of mutually beneficial interactions are ubiquitous and an important phenomenon particularly in ecological communities where large numbers of species interact with one another [127]. These symbiotic relationships are essential for biological survival and development with close co-operation needed to achieve evolution and innovation [130]. Mutualistic interactions not only exist between species but also occur amongst individuals and organisations that interact for the purpose of creating mutual value for participants [131]. Similar to how biological groups are dependent on each other in a natural ecological system, individuals and organisations depend on one another for co-existence and co-evolvement to ensure balance within the ecosystem [130], [132] .

The nature of interrelationships between stakeholders determines the stability and health of the ecosystem in the face of change [131]. The symbiosis concept is used to explain this interdependence by identifying how individuals and organisations interact with one another in a collaborative relationship [21]. This concept is illustrated in a simplified diagram shown in Figure 4.3 where four ties are used to show the nature of the interactions occurring between individuals and organisations in an ecosystem. Structural ties form the connection between organisations and it is where coordination, communication channels, key performance indicators, job specifications and hierarchies are established. Workflow ties link different individuals through their varying roles and therefore their obligations and liabilities. Friendships ties are connections formed between the individuals which include the friendship connections and relationship, the trust formed and the mutual understanding. The processual tie once again links the organisations and is where procedures, protocols, standard operating procedures, the rules and the regulations are considered and developed [129].

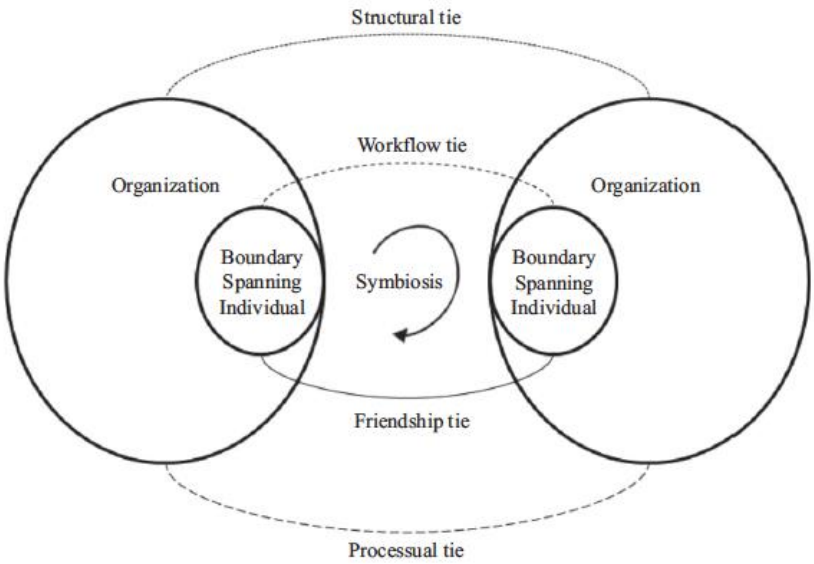


Figure 4.3: Interactions between individual stakeholders and organisations in an ecosystem [127]

The symbiotic relationship between stakeholders in an ecosystem, builds upon the notion of co-evolution which is said to be a joint outcome of both co-specialization and complementariness in an ecosystem [129]. From the co-evolution perspective, ecosystems are shaped by stakeholders who continuously act and react to environmental changes and pressures that arise as a result of other stakeholders [133]. In this regard, ecosystems evolve by means of mutual influences which are the inputs that facilitate the co-creation of value. Co-specialization emanates from the need to support the ecosystem and therefore drive its performance by providing specialized inputs. From the perspective of the stakeholder, co-specialization enables each stakeholder to contribute their core capabilities through collaboration in order to drive the ability to create value [21]. Interactions are an important dimension necessary to ensure the success of co-specialization and therefore the realisation of value creation. It is expressed through the functional characteristics of each stakeholder as well as through their responsibility in the ecosystem. The Complementariness between participants comes into play at this point as it enables value co-creation by ensuring that the competence and capability of each stakeholder in the ecosystem is cumulative and synergistic [21]. Based on this explanation, co-evolution theory requires a shift in the way ecosystems are analysed. The perspective requires the analysis to not only exist within the bounds of adaptation processes, which come as a result of environmental changes, but should also to include an analysis on the capabilities of stakeholders and therefore capacity of the organisation within the ecosystem [133].

4.4.3 Institutional stability

The final common characteristic of an ecosystem is that of institutional stability. From the ecosystem perspective, emphasis is placed on the central role of actor-generated institutions and institutional arrangements that influence the trajectory of institutional stability and change [133], [134]. This perspective suggests that actors are embedded in a set of interrelated rules and norms that encompass coordination, legitimacy and trust, and governance mechanisms. Here, actors can jointly reconstruct and change value co-creation practices to allow for new solutions to emerge which ultimately advance change in the institutional arrangement. This is vital for the creation, development, health, and maintenance of an ecosystem [21], [134]. Introducing institutional theory in the ecosystem analysis doesn't mean that the ecosystem should be considered to be a type of organisational field, as both are nebulous concepts, however it suggests that an ecosystem is analogue to an institutional field in that it has its own institutional actors, logics and governance structures [21]. Institutional theory therefore provides a useful lens to understand the organising principles, rules and norms in ecosystems. The three institutional characteristics of institutional stability which include: coordination, legitimacy and reputation, and governance mechanisms are discussed in the sections that follow.

4.4.3.1 Locus of coordination

Coordination in an ecosystem helps to drive the performance of the network by enabling both value creation and sharing. A critical element of coordination is the underlying architecture that connects all participating actors together [87]. This underlying architecture forms the central actor that coordinates the ecosystem, which is vital for the health and stability of the ecosystem [21]. The architecture behaves as a platform that enables value creation through the provision of services, tools and technologies that participants use to enhance their own skills and performance [134]. The nature of such platforms are set to increase the ease at which nodes can connect with one another and also increases the robustness of the network to environmental shocks [21]. These shocks, referred to as "exogenous shocks", place actors in complex positions where the familiar institutional arrangements of an ecosystem might prevent them from reaching their goals. Therefore, for an ecosystem to be useful there needs to exist significant coordination [21], [134].

Specific dimensions are adopted to encourage the coordination of the ecosystem through rules of engagement, standards and codified interfaces [21]. This essentially assists in facilitating collaborations that span the full range of relationships existing between stakeholders and the

relationships that exist between stakeholders and their ecosystem [87], [135]. This concept is challenging to implement however specifically in the context where radically different types of stakeholders are involved [135]. To better understand these unique challenges, focus needs to be placed on the range of different stakeholders that collaborate out of necessity. In addition, the technologies that are used to support the coordination between stakeholders must also be considered.

4.4.3.2 Legitimacy and reputation

Legitimacy and reputation provide the validity that organisations seek in their decision to participate and remain in an ecosystem [135]. The legitimacy and reputation of an ecosystem is vital for its survival and to ensure that the ecosystem is greater than the sum of its parts [21]. This is based on the idea that participation in the ecosystem leads to value creation and value capture. Through active management of reputations and relationships, uncertainty, ambiguity and conflict between participants within the ecosystem can be minimised [21].

Legitimacy is a generalised perception that views the actions of an entity as desirable within a socially constructed system of norms, values, beliefs and definitions [21]. Legitimacy and social acceptability is essential for central actors to gain leadership positions within an ecosystem in order to facilitate it effectively. In the context of ecosystem creation and facilitation, legitimacy can be distinguished into two forms: cognitive legitimacy and socio-political legitimacy [136]. Cognitive legitimacy, simply put, is what attracts actors to participate in an ecosystem. It is built through shared knowledge and a shared understanding of what the ecosystem is about, what it seeks to achieve and what the roles of the varying actors within the ecosystem are [136]. Socio-political legitimacy on the other hand focuses on gaining acceptance and support from key stakeholders, opinion leaders and the wider society within which the ecosystem resides. The source of socio-political legitimacy lies within the bounds of legal compliance as well as through the consideration of how ecosystems can get support from key stakeholders, opinion leaders and the wider society [136], [137].

4.4.3.3 Governance mechanisms

The governance structure is perhaps the most salient aspect of an ecosystem [136]. These mechanisms exercise power and authority in ecosystems through instilling conventions such as rules and norms to govern the behavior of participants in the ecosystem [136]. Accordingly, governance is an important mechanism that orchestrates and manages the way of communication between different parties [21]. Ecosystem participants are bound by complex relations which are established through a system of conventions that are shared by participants that provide a framework for value co-creation and symbiosis [138]. In order for an ecosystem to be successful and for its robustness to not be threatened, participants in the ecosystem must conform to the values, rules and norms shared within the ecosystem [21], [136].

Different governance modes influence an ecosystem's functions and services [21]. These modes of governance include hierarchical governance, scientific-technical governance, adaptive collaborative governance and the governance of strategic behavior. These four approaches of governance form the basis on which different arguments are used to implement policies in ecosystems as they take into account the people and organisations making decisions [139]. Hierarchical governance reflects the influence that higher level policies have on the formulation and implementation of agreements and laws within an ecosystem. These decisions are collectively agreed upon and are implemented in a hierarchically organised fashion where ideas are transferred from the higher level policy to the lower governance level [139]. Hierarchical governance is aided by scientific-technical governance to have an effect on an ecosystem [21]. Scientific-technical governance is needed to inform management. At Its core, it focuses on the probable influences of decisions on the ecosystem. Accurate scientific-technical support constructs knowledge and supports systems to maximise the possibility of reaching policy goals within an ecosystem [139]. Adaptive collaborative governance shifts this attention from knowledge and focuses on the actors who use and produce it. This

governance mode evolves within the context of multilayered influences which create both opportunities and constraints for collaborative actions. These influences include political, legal and socioeconomic influences amongst others [140]. This collaborative approach is also rooted in managerial practices. At its core, it emphasizes the importance of knowledge accumulation, collective learning, and sensitivity to changes. The aim is to integrate a range of arguments that are both analytical and pragmatic in order to advance shared goals [139], [140]. Attention is finally paid to the strategic interest-based behavior of actors participating in the ecosystem and how to deal with it. Actors participating within an ecosystem for economic purpose tend to behave in ways that benefit their own interest rather than that of the collective. Governance strategic behavior therefore highlights these arguments and governance to overcome these barriers [139].

4.5 Identifying an appropriate structural approach for the framework

An investigation on existing FMTs was conducted in the study to identify the most appropriate structural approach for the development of the conceptual framework. The aim of the investigation was to create a benchmark of relevant literature by exploring work that has been done in terms of FMTs relating to value creation. Though frameworks, models and tools differ as shown in Table 4.4, the researcher investigated existing FMTs as they could all help to inform the design of the value creation process, management and ecosystem governance. This helped to inform the researcher as there is currently no literature that is known to the researcher that focuses on the design, development and implementation of a value creation system that is supported by information systems in the context of the South African healthcare system, as previously mentioned, in Section 3.5.

Insight gathered from the investigation was used collectively to inform the researcher on the design, management and ecosystem governance of value creation. This required the consideration of key concepts, relationships and practical measures. Furthermore, insight gathered from the investigation was used to identify possible gaps within existing FMTs that could be addressed by the framework. This insight was translated to the context of the research to develop the framework.

Table 4.4: Difference between Framework, model and tool

Term	Description	Reference(s)
Framework	A supporting structure which helps to define concepts and dimensions of a phenomenon or phenomena.	[27]
Model	Represents the relationship between variables and their outcomes	[141], [142]
Tool	An instrument that can be used to perform practical operations	[86]

4.5.1 The investigation approach

The first step in the investigation of the FMTs was to establish search criteria in order to identify the most appropriate and relevant FMTs. The inclusion and exclusion criteria were established to evaluate whether or not further investigation and analysis could be done on the FMT. The criteria were established using a process consisting of three stages. Criteria formulated in Stage 1 were done so using the research objectives and research questions established in Section 1.4. Criteria from Stage 2 were formulated by considering the focus areas highlighted in literature. Finally, criteria from Stage 3 were developed from the overarching aims of the framework.

In Stage 1 the research objectives and the research questions were used to highlight key aspects that should be included in the framework. In regard to the research objectives in section 1.4.2, only the objectives from the Phase 1 were considered since outcomes from Phase 1 result in the

preliminary framework. The objectives from Phase 2 comprises the framework evaluation processes which are not relevant for this investigation. Table 4.5 presents the research objectives and research questions used to formulate the inclusion criteria along with the key components that were deduced from each respectively.

Table 4.5: Stage 1 criteria for FMT identification

	Research objective or question	Key component for the formulation of the framework
Research objectives	Identify and examine fundamental value creation concepts from an ecosystem perspective by formulating a scoping review.	Value creation concepts Ecosystem dynamics
	Establish the context and requirements for a value creation system that is supported by information systems within a complex and dynamic ecosystem by formulating a conceptual literature review.	Context of value creation and the requirements
	Explore and assess existing frameworks, models and tools that are relevant to value creation and ecosystem design and management.	Framework, Models, Tools
	Formulate a preliminary conceptual framework to aid in the design, development and implementation of a value creation system.	Value creation system design Value creation system development Value creation systems implementation
Research questions	What are the key value creation concepts considered from an ecosystem perspective?	Value creation system design Value creation system design requirements
	What role do information systems have in value creation?	Value creation system evolution Information system evolution
	What are the key defining characteristics of the ecosystem construct?	Ecosystem dynamics
	How can these characteristics relate to healthcare systems in developing countries?	Health system requirements

Stage 2 of the process consisted of using the key outcomes from the literature reviews conducted in the study. These literature reviews included the scoping review in Chapter 3 and the conceptual literature review in Chapter 4. The purpose was to identify highlighted focus areas that related to units of analysis in the literature reviews. These focus areas were extracted and used to develop the inclusion criteria for FMT identification. Table 4.6, presents the key focus areas.

Table 4.6: Stage 2 level specific criteria

Level	Focus of level (from literature)	References
Political and economic environment	Innovation, strategy development, strategy management	[139]- [62], [63]- [64], [65]- [66] [67], [68], [69], [70]
Organisation	Value-based service, information technology, execution barriers, interoperability	[71], [72], [73], [74], [75], [76], [66], [77], [78], [79], [80]
Actor	Value creation, collaboration, open innovation	[22], [72], [62], [63], [64], [75], [66], [69],[77], [78]
Ecosystem	Governance, Adaptability, Collaboration, Value co-creation, Innovation, health	[119], [70], [75], [69], [62], [63], [66], [21], [111]

Criteria in Stage 3 were built on the intended aims of the proposed framework. When paired with the inclusion criteria, the overarching aims of the framework formed an additional layer to the FMT identification process. These criteria were used to screen the FMTs to ensure that they not only meet the criteria set in the previous two stages but also aligned with the overarching aims of the proposed framework. The overarching aims of the framework were:

1. A practical system for the creation of value within the context of public healthcare in South Africa.
2. Present a holistic system-perspective that reflects the boundaries within which value can be created.
3. Explore value co-creation and activities involved in 'value' 'co' and 'creation'.
4. Address the challenges associated with ineffective management and use of information and how that affects the value that is created in healthcare.

Through the consideration of the criteria developed in Stage 1, Stage 2 and Stage 3, the researcher was able to identify the most appropriate FMTs to investigate. The FMTs identified are discussed in the sections that follow.

4.5.2 Co-creation design and value management

The FMTs included in this section focus on the co-creation design and value management which is significant for the collaboration of entities in complex environments. The identified FMTs include a framework to support knowledge co-creation through networked relationships [143], a co-creation algorithm [141], a DART model [142] and a value mapping tool [86].

4.5.2.1 Co-creation framework: to support knowledge co-creation through networked relationships

This framework consists of collaborative networks that allow for the continuous co-creation of new knowledge [86]. The collaborative networks are considered to be dynamic configurations of stakeholder connections that foster knowledge co-creation. In this framework, knowledge co-creation processes are considered to be system-orientations that brings together a wide range of knowledge sources and types. The framework also involves boundary crossings which define the socio-ecological and socio-cultural differences that exist between knowledge and/or professional domains, and stakeholder groups. These boundaries can result in the discontinuity of actions and/or interactions [143].

The framework provides an understanding of how stakeholder groups effectively support knowledge co-creation. The framework achieves this by including components that depict pre-existing conditions and external factors that either hinder or provide new opportunities for collaborative stakeholder networks. These collaborative networks comprise of networked relationships that are facilitated by bridging organisations [143]. The role of bridging organisation is to act as an intermediary between diverse stakeholder groups and the networks that are in support of collaboration and creation of knowledge. Bridging organisations vary in form, degree of scope, stakeholder participation and formalisation [143].

The framework highlights properties of various dimensions that either enhance or limit knowledge co-creation. The properties include: properties of knowledge outcomes, properties of stakeholders, properties of the collaborative process and the properties of relationships. Each of the properties are described in Table 4.7.

Table 4.7: Properties of knowledge co-creation [142]

Property	Description
Knowledge outcomes	Knowledge properties have an effect on the rate at which knowledge is acquired, how much of it is retained and how easily it diffuses within and between stakeholder groups.

	The knowledge co-creation process and its outcomes need to be creditable, timely, tangible and useful.
Stakeholder groups	Diverse stakeholder networks are needed to enhance the knowledge co-creation process as it leads to more socially robust knowledge. In addition, stakeholders need to be prepared to participate in the process.
Collaborative process	The collaborative process must enable a neutral space for open and iterative dialogue that allows stakeholders to learn and express their interests. Furthermore, there must be clear rules of the process to guide the interactions between the stakeholders.
Relationships	Repeated interactions build trust between stakeholder groups within a collaborative network. High levels of trust between stakeholders is important for successful co-creation. Trust building involves repeated personal and informal interactions between stakeholders. This is important for the collaborative process as it results in strong network ties between stakeholders.

When looking at the co-creation process and properties of the framework, the key argument is that in order for the co-creation process to be effectively facilitated, stakeholders need to be active participants in collaborative networks through intensive interactions [143].

4.5.2.2 Co-creation algorithm

This model consists of an algorithm that changes the center of gravity from the inside of a company to its environment for the purpose of stimulating innovation [143]. In this model, co-creation is characterised as being an interdisciplinary, interactivity and iterative process through which value is created for the environment [141]. The algorithm incorporates traditionally identified elements of co-creation which include: open culture, open resources, open knowledge, submitting, tinkering, co-designing and collaboration [141]. Six parameters are also used to jointly determine the organisation's effective co-creation capacity as seen in Figure 4.4. These parameters include: (1) organisational openness; (2) the organisation's ability to reduce the impact of environmental complexity; (3) the importance of close relationships with customers; (4) environmental complexity; (5) preparedness to exploit co-creation; and (6) the dynamics of competitive advantage creation [141].

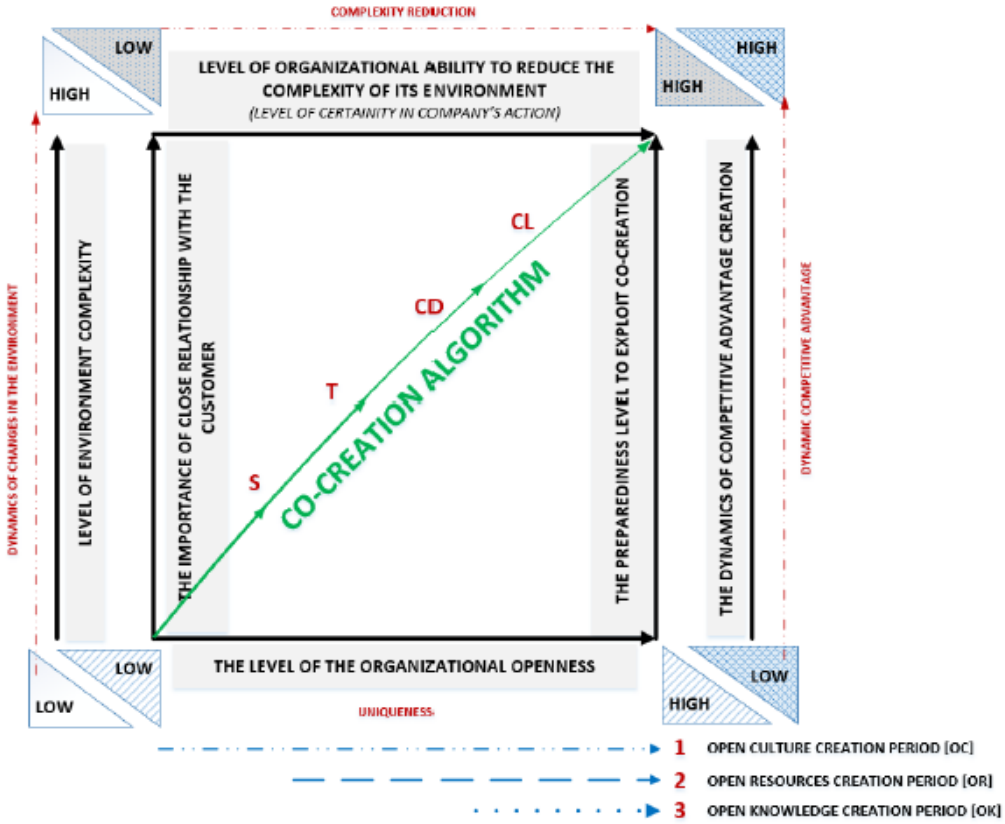


Figure 4.4: Co-creation algorithm [139]

The model is interpreted as a manifestation of the belief that with the increase in an organisation's environmental complexity it should strive to build a closer relationship with its customers. Such an action will ultimately allow for: (1) the lowering of the organisation's sensitivity to environmental changes; (2) faster adaptation to changes and possibly anticipation; and (3) using knowledge and information to make better business decisions [141]. The diagonal axis, seen in Figure 4.4, forms the plane of the co-creation algorithm, with the high/low values of the parameters used to determine the stage of co-creation. The stages of co-creation include: Submitting (S), Tinkering (T), Co-designing (CD) and Collaborating (CL) [141]. Submitting is the simplest form of co-creation and is where the company has full control over the contribution activity. Tinkering involves contribution activity from the public with the selection activity fully controlled by the company. Co-designing is a type of co-operation that is more narrow and targeted. It is a level where the outcomes are dependent on the level of stakeholder involvement. At the level of collaboration, all participants are open to suggestions from other participants. This level involves active use of resources and knowledge [141].

The model emphasizes the need to be able to function in a changing environment as well as the ability to cooperate with various partners [141]. Organisations need to be transparent, especially in the context of information, by providing free and unrestricted information and knowledge. In addition, to encourage collaboration and therefore co-creation, owners and managers need to learn how to effectively manage the relationships formed between the participants within the environment [141].

4.5.2.3 DART model

The Dialogue, Access, Risk assessment, Transparency (DART) model is a popular framework used to conceptualise value creation and is a valuable guide for implementing the concept of value co-creation [141]. The model takes on a multiplicity perspective of large stakeholder groups within a

healthcare system. These perspectives differ due to the influence of different priorities and are reflected in the diamond shape of the model which is used as a metaphor to symbolize the achievement of ideal conditions in health care. The axes of the model are populated as: dialogue, access, risk assessment and transparency, as can be seen in Figure 4.5 [142]. According to the model, co-creation can only occur when the dialogue, access, risk assessment and transparency conditions are jointly fulfilled. These four elements represent the interactions that occur between the individuals participating in the value co-creation process [142]. Dialogue requires interactivity, deep commitment and the willingness from participating parties. Access relates to the use of resources that are used to carry out the actions of the participants. Risk assessment is associated with the right to complete access to information in order to accurately assess risk and to make specific decisions. Transparency requires the limitation of information asymmetry by ensuring openness and access to resources [142].

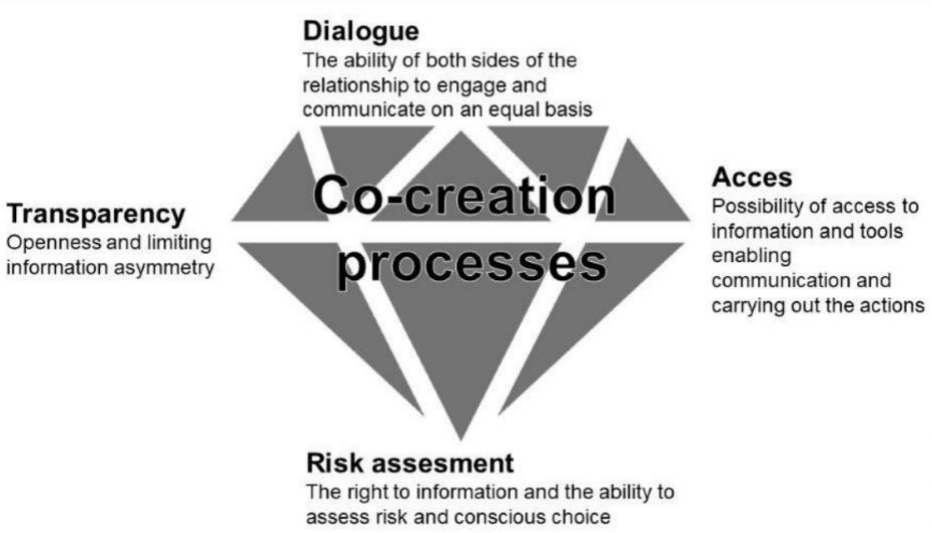


Figure 4.5: DART model [140]

Although the model has limited application in the healthcare system, it provides valuable information regarding the relationship between the patient, doctor and other stakeholders [142]. In healthcare related services, value cannot be created without the patient as they take on various roles which include: the customer, consumer, provider, controller of quality, and co-producer. Increasing value in the healthcare system therefore needed to improve the well-being of the patient [142].

4.5.2.4 Value mapping tool

The value mapping tool is a tool that is proposed to support business modelling for sustainability. The tool seeks to create new forms of value while addressing value that is destroyed or missed through a multiple stakeholder view of value [142]. The tool has a network-centric perspective that ensures the consideration of value from a total system-wide perspective instead of a narrow firm-centric view. The tool takes on a circular structure to facilitate the holistic system-perspective of value and also to encourage the equal consideration of all stakeholders, their interests as well as their interrelatedness as seen in Figure 4.6. The tool further encourages better engagement and stimulates creative thinking [86].

The value mapping process begins by defining the offering of the firm in order to shift the focus from the firm to its offerings. This is essentially to support the network-centric perspective. The stakeholders are then identified and placed into the segments of the tool [86]. The tool requires that specific stakeholders such as the society and the environment be identified to facilitate the analysis. Brainstorming is used to populate each of the stakeholder segments and the various forms of value that is generated for the respective stakeholder [86]. A lifecycle approach is used to assist the

process of identifying stakeholders and the various forms of value throughout each of the stages [86].

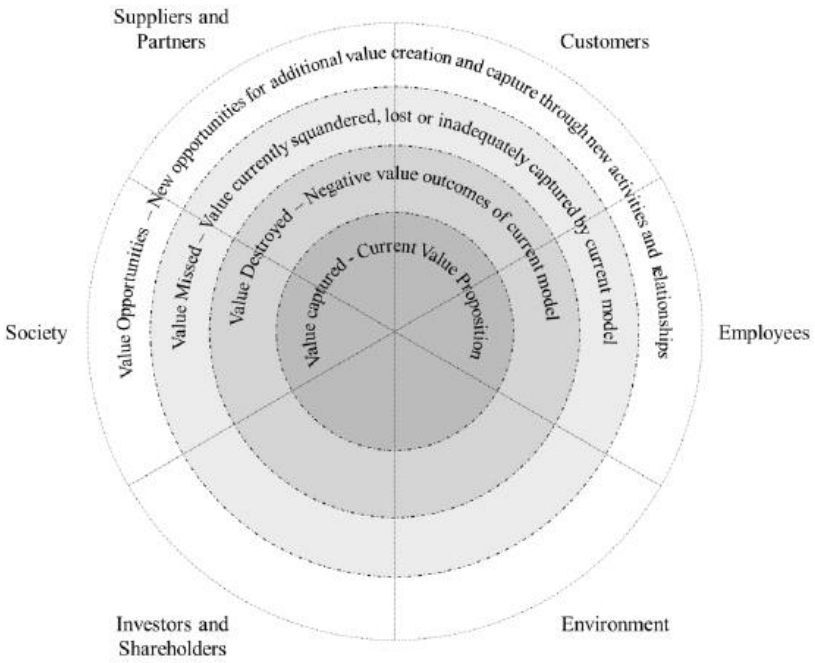


Figure 4.6: Value mapping tool [141]

The novel value mapping tool reconfigures the network of stakeholders involved in the value creation and delivery process through business model innovation. The model fully integrates sustainability into the core of the business in order to create a balance between social, environmental and economic value. In addition, the tool identifies the activities performed during the delivery process that collectively destroy value. Destroyed value is linked to environmental damage and the social impact of the firm's activities. The tool also identifies missed value which can result from stakeholders performing below the industry's best practices by failing to capitalise on existing resources and capabilities [86].

4.5.2.5 Analysis

Analysing the co-creation design and value management of the FMTs collectively resulted in several elements surfacing from the FMTs. These elements were highlighted for the purpose of being considered during the formulation of the value creation system developed in the research. The importance of building strong relationships with stakeholders through active participation in collaborative networks is essential to facilitate value creation and value co-creation. In addition, three of the four FMTs emphasize the importance of information and knowledge sharing that is free and unrestricted. The reason for this is to encourage transparency which results in the openness of an organisation and limits information asymmetry. In regard to the ecosystem perspective, several elements were established both in the internal and external environment. These elements essentially reduce the impact of complex the environment, both internal and external, in order to adapt faster to changes and to make better decisions.

A visual analysis is provided in Table 4.8 on the previously discussed FMTs, where general elements and criteria-based elements were used to analyse the FMTs. The general information included: the aim of the FMT; whether the FMT was a framework, model or tool; the layout of the FMT; and the related research area of the FMT. The criteria-based elements related to the previously defined criteria in section 4.5.1. In the table, FMT1 relates to the framework developed to support knowledge

co-creation through networked relationships; FMT2 is the co-creation algorithm; FMT3 is DART model; and FMT4 is the value mapping tool.

Table 4.8: Analysis of FMTs

		FMT1	FMT2	FMT3	FMT4
General information	Main aim of FMT	To support knowledge co-creation through networked relationships	To use the concept of co-creation to reduce the complexity of the environment	To provide valuable information on the relationship between the patient, healthcare practitioners and other stakeholders	To develop a network-centric perspective with a multiple stakeholder view for sustainable value creation
	Framework, model or tool	Framework	Model	Model	Tool
	Related research area	Collaborative network strategy	Environmental complexity, SMEs	Health system	Business model
Criteria-based elements	Value creation system design	✓	✓	✓	✓
	Ecosystem dynamics	✓	✓	✓	
	Information system evolution	✓			
	Health system requirements				✓
	Strategy development	✓	✓	✓	✓
	Innovation	✓	✓	✓	✓
	Holistic system-perspective of value				✓
	Stakeholder groups	✓	✓	✓	✓

4.6 Chapter 4 Summary

Chapter 4 formed the conceptual literature review which included the review of four main areas: (1) ecosystems; (2) information systems and their key characteristics; (3) the dynamics of value creation; and (4) the need for an appropriate structural approach for the framework development.

Literature obtained from the scoping review, conceptual literature review, and the frameworks models and tools investigated, combined with the growing understanding of ecosystem dynamics resulted in the development of the preliminary conceptual framework. The preliminary framework is introduced in the following chapter.

Chapter 5: Framework evolution Part 1: Towards the development of a preliminary conceptual framework

5.1 Introduction

Chapter 5 presents the development of the preliminary conceptual framework. This framework formed the foundation for the development of the final management tool. To achieve this, similar concepts that emerged from identified trends in the scoping review and the conceptual literature review were integrated into one new concept as suggested by Jabareen [27]. The framework therefore consisted of an inventory of concepts grouped under "*higher level*" concepts that needed to be considered for the value creation process. The intermediate goal was primarily to identify building blocks that could be used to support the creation and success of a value creation system. It is evident from literature that, if well directed, information systems have the potential to facilitate the co-production of value through interactions and information and knowledge exchange amongst different participating actors. This has the potential to lead to improved quality of care received by patients and improved management of healthcare costs. The concepts that were incorporated into the framework drew from diverse literature such as the business ecosystems [27], information systems [22], [105] social science [108], [111], [123], data-driven ecosystems [143], [98] and Institutional theory [99], [21].

Chapter 5 objectives:

- Integrate emerging concepts identified from trends
- Present and discuss the first stage of the framework development, namely the preliminary conceptual framework
- Discuss each of the dimensions comprising the framework

5.2 The integration of concepts

The value creation system aimed to address the complexities within healthcare systems and further aimed to determine how value could emerge from the collaboration between participants who interact using health information systems. Trends and key elements from the coded literature were used to identify two strategic categories, namely functions and structural components which comprise the complexities embedded in an ecosystem. These strategic categories were used to inform the value creation system.

The resulting organisation of concepts presented in Figure 5.1 is intended to provide a branch of knowledge for researchers, policymakers, and health care workers for characterising important strategic features of a value creation system. The figure also considers a key element called 'approaches' which considers the design, development and implementation of a value creation system. This key element was deduced from the discussion in section 4.5. Although Jabareen's approach was followed in the research, the author also checked the logic of how the concepts were categorised based on the understanding formed during the formulation of the scoping review and the conceptual literature review.

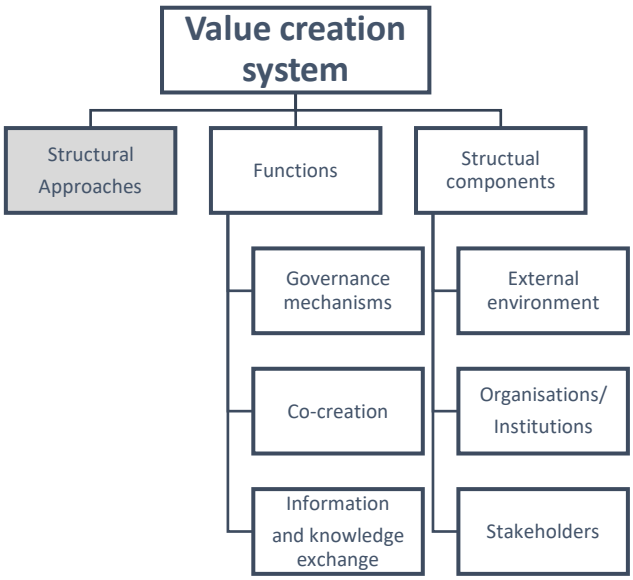


Figure 5.1: Integrated concepts [20], [21], [102], [116]

The concepts in Figure 5.1 formed the building blocks used to formulate the preliminary conceptual framework for a unique interpretation of a value creation process in healthcare ecosystems.

5.3 Requirements for the development of the framework

A key rule in designing a solution lies in developing a sound design outline. The design outline essentially provides an idea of the intended solution prior to the development of the fully detailed design. Developing the design outline involves formulating key requirements that are needed to guide the design process. Van Aken and Berends [144] use categories to group the different types of requirements that should be addressed by a design. These categories include:

1. Functional requirements: which are key specifications which usually relate to the performance or the demands of the designed solution
2. Design restrictions: address the limits of the design which may be negotiated
3. Boundary conditions: which are the design requirements that need to be met and cannot be negotiated
4. User requirements: are requirements relating to the use of the framework

The research draws inspiration from these categories in order to develop the design requirements of the framework. The design requirements were deduced from the literature and are linked to the strategic categories discussed above in Section 5.2. The set of requirements that the framework needed to meet are discussed in Table 5.1.

Table 5.1: Framework requirements deduced from literature

Framework requirements	Code	Description and reference in research study
Functional requirements	**FR1**	The framework should encourage sustainable healthcare development *(Section 1.1) and encourage* system longevity and propensity for growth *(Section 4.2)*
	FR2	The framework should identify how collaborative environments can be formed within a healthcare system *(section 1.1)*
	FR3	The framework should drive continuous improvement *(Section 1.1, 3.6, 4.4)*
	FR4	The framework should support the economic development and human well-being *(Section 1.3)*

	FR5	The framework should provide fundamental value creation activities needed within a healthcare system *(Section 1.4)*
	FR6	The framework should highlight the role of information systems in value creation within the ecosystem *(Section 1.4)*
	FR7	The framework should encourage the evolution of healthcare systems through interactions, cooperation and collaboration *(section 3.5)*
	FR8	The framework should acknowledge the different governance modes that influence how the ecosystem functions *(Section 4.4)*
	FR9	The framework should encourage transparency through free and unrestricted sharing of up-to-date and useful information and knowledge *(Section 4.3, 4.5)*
	FR10	The framework should provide an understanding of how stakeholder groups can effectively support knowledge co-creation by including components either hinder or provide opportunities for collaborative stakeholder networks *(Section 4.5)*
	FR11	The framework should show how traditional components of co-creation can be utilised in complex and ever-changing environments *(Section 4.5)*
Structural requirements	**SR1**	The framework should address the theoretical underpinnings of the dynamic ecosystem construct and its actors *(Section 1.4)*
	SR2	The framework should adopt a holistic system-perspective to conceptualise the ecosystem construct by considering the three health system levels which include: the political and economic environment of the health system, the healthcare facility and the primary stakeholders *(section 3.5, 4.4)*
	SR3	The framework should encourage active integration and collaboration of stakeholders with varying needs and capabilities to increase value *(section 3.6)*
	SR4	The framework should address the network of explicit and implicit relationships that span both the internal and external environment *(Section 4.4)*
	SR5	The framework should acknowledge the role of the healthcare system as an intermediary between diverse stakeholder groups and networks *(Section 4.5)*
Boundary requirements	**BR1**	The framework should reflect the boundaries within which value is created in a healthcare system enabled by information systems *(Section 1.3)*
	BR2	The framework should assist ecosystem actors, who share the same institutional logic, with a set of common rules and norms to govern their behavior in the ecosystem *(Section 4.4)*
	BR3	The framework should support value co-creation through networked relationships *(Section 4.5)*
User requirements	**UR1**	The framework should assist users with tools to address complex challenges affecting value creation *(Section 1.4)*
	UR2	The framework should assist users to understand how value can emerge through the use of information systems by providing them with favorable actions for value creation *(Section 3.5)*
	UR3	The framework must assist users in understanding the dynamics occurring in the ecosystem and the implications thereof *(Section 4.2, 4.4)*

Meeting the requirements outlined in Table 5.1 was important for the development of an appropriate framework that adheres to the study goals and objectives. The framework was developed from notable concepts that were identified in the literature. The reasoning behind the inclusion of these elements is discussed in the section below and subsequently the preliminary conceptual framework is presented.

5.3.1 The external environment

From the literature it was seen that the environment may be unpredictable in nature due to the political, economic and social instability that exists [139]. The external environment has been found to form pre-existing conditions that either provide new opportunities for value creation or hinder the success of the value creation system [127]. This is largely because these factors may act as constraints that shape the environmental structure [69]. The strategic behavior of the organisation is subject to these factors, with the organisation needing to respond to it in accordance with their respective importance [139]. Due to the impact that the external environment has on the organisation, it was considered that its role in the value creation process could be of importance to encourage flexibility and adaptability in changing circumstances that may arise [143].

5.3.2 The organisation

The organisation, which is termed the “bridging organisation” in the framework, is recognised in literature as a key feature for collaboration as it forms an intermediary between the diverse stakeholders and their networks in support of the value creation process [69]. The main purpose of the bridging organisation is to facilitate the development of a network that brings together multiple positions, knowledge types and sources while providing a platform for value creation [143]. The idea is for these collaborative networks to become learning networks that cultivate continuous value co-creation, improvement of practices and institutional development. The bridging organisation therefore provides an environment for new collaborative networks to arise for the purpose of developing new social practices and interactions [143].

In the literature it was found that deliberate co-creation processes, enabled by the organisation, may be necessary to facilitate a neutral space for open and iterative dialogue. This is to allow stakeholders to learn and share knowledge for the purpose of co-constructing new, innovative and personalised experiences [143].Though co-creation is considered to be the center of gravity in the design of services performed by organisations, literature suggests a shift from the inside of the organisation to its environment for the purpose of stimulating innovativeness [141]. Developing a deeper understanding of the environmental factors of the organisation’s networks may be necessary to understand the impact that they have on the organisation’s desired outcomes. This important as these networks are dynamic in nature and continuously changing according to the literature [141]. Also, these factors, namely political, cultural and institutional factors play a large role in the power asymmetries and therefore information asymmetries within the organisation which in turn influences the organisation’s co-creation process [141].

Information sharing through the use of information systems is a notable concept that surfaced in the literature as it is said to be essential for the survival of an organisation in the environment [145]. Information systems form an integral part for efficient and effective information sharing within an organisation. Literature suggests that the use of seamless interfaces to facilitate sharing of vital information may be needed to perform varying functions using the same set of resources within an organisation [143]. Information sharing therefore encourages the distribution of useful information for systems, people and organisational units [145]. Repeated interactions through information sharing has the potential to build strong network ties between network members which could eventually lead to high levels of trust being built between them. It also leads to the development of a shared understanding, vision, purpose and culture [105]. The role of information sharing in the value creation system is considered in this research as literature emphasizes its contribution to the success of the value creation process. This success, according to literature, includes how information sharing: (1) reduces costs, (2) improves relationships with stakeholders, (3) increases the flow of resources, (4) enables efficient delivery of services, and (5) facilitates the achievement of a competitive advantage [143]. Literature explains that in order to attain this success, the information systems that facilitate information sharing have to have semantic interoperable capabilities that support collaboration across platforms [104]. Semantic interoperability goes beyond

merely sharing information and deals with its interpretation to ensure that the information that is transmitted is fully understood by the receiving party [145].

5.3.3 The stakeholder

Evidence from literature has shown that the power of stakeholder networks lies in their diversity which may lead to a more robust value creation system [145]. The network refers to a set of relationships that connect the participating stakeholders to one another. Elements from governance mechanisms, namely the hierarchical governance, scientific-technical governance, adaptive collaborative governance and the governance of strategic behavior, discussed in Section 4.4 are used to characterise the stakeholder network in the framework. This is mainly due to the findings in literature that suggest that these governance modes influence how the ecosystem functions by taking into account the people and the organisation's decision making processes [21],[139].

The consideration of the readiness together with the ability of stakeholders to engage in value co-creation practices also presented importance in literature [143]. It was found that this naturally encourages stakeholders to form symbiotic relationships that allow for traditionally separate stakeholders to engage in the value co-creation process [143]. To successfully facilitate the co-creation process and therefore create value, it is suggested that stakeholders may need to be jointly involved in the process to ensure value formation. However, value formation isn't necessarily guaranteed as the process can either be a creative or a destructive process. Literature explains that the quality of the interactions between stakeholders are fundamental to successfully create value, as does the organisation's understanding of the stakeholder outside of the value creation process [123]. Understanding and learning more about the stakeholder and their individual context and how that influences the value creation process aids in the effective management of these interactions [111].

5.3.4 Outcomes of value creation process

Understanding the desired outcomes of the value creation process may be needed to determine the necessary activities that need to be performed by the organisation going forth. These outcomes are dependent on the credibility, salience and legitimacy of the value creation efforts [143]. Literature explains that in order for the value creation process to be considered credible, the collaborative stakeholder network should deliver timely and useful outputs. These outputs include synthesized feedback meetings and reports that discuss the rigorous measurement of the value created. This essentially allows for: (1) ongoing reflection on the effectiveness of the value creation process and its outcomes; (2) the discussion of lessons learnt; and (3) driving system progress [111],[143]. Legitimacy refers to the extent to which the value creation efforts acknowledge the sources of value that differ for different participating stakeholders in the ecosystem [143]. According to literature, flexibility, efficiency and innovation form the unique sources of value that govern and henceforth act as drivers of the legitimacy of the value creation system [143]. The salience of the value creation process refers to the quality of the knowledge that is used, modified and shared within the value creation system [21]. These factors that influence the desired outcomes of the value creation process are a reflection of the findings from literature and were incorporated into the framework due to their role and significance in the value creation process.

5.4 The preliminary conceptual framework

This section presents the integrated structural components and functions of the value creation system which were intended to provide a systematic process that could be used to guide the creation of value in a healthcare system. The holistic system-perspective encouraged the consideration of the three health system levels which included: the political and economic environment of the health system, the healthcare facility and the primary stakeholders. These components shape the healthcare system and were used in the development of the framework that explores their inter-relatedness.

The structural components and functions that should be considered form an essential governance structure that allow for the incremental improvement of the health system over time, by taking into account the people and the organisation decision making processes that are facilitated through the implementation of policies and standards. Table 5.2, on the next page, presents the preliminary conceptual framework that includes the concepts that were considered to be vital for the successful functioning of the value creation system within its ecosystem.

Table 5.2: The preliminary conceptual framework

Dimension	Considerations	Description	Reference
The external environment	Funding and support system	Funding and support for administrative purposes as well as to create, monitor and facilitate the implementation and realisation of proposed plans and strategies.	[143]
	Political support and buy-in	Political support is necessary to address social needs. There is a great variation in these needs and actual delivery. Conflict and unequal interests need to be considered and overcome to ensure adequate governmental and civil service capability.	[143]
	Regulatory standards/guidelines	Carefully drafted, science-based knowledge constructed from components which include: policies, healthcare organisations and people. This knowledge forms the standards needed to ensure the delivery of important services.	[102], [146]
	Incentives	Reward structures that are put in place to promote better performance in the healthcare facility/organisation. Incentives may increase in instances where the achievement of the facility/organisation's goals is dependent on the participation of stakeholders whose interests and values may differ.	[139]
	Healthcare uncertainty	Uncertainty can negatively affect the performance and commitment of actors within the healthcare ecosystem due the inability to gain full insight on all aspects of the ecosystem. This can be mitigated through the flexibility ecosystem and risk management techniques.	[143]
	Information asymmetries	Information asymmetries develop from power asymmetries that exist between individuals occupying different network positions. Results in participating parties having differing levels of knowledge and information. Information asymmetries can be reduced by addressing power asymmetries through collaborative processes.	[147]
	Initial trust levels	Trust built between participating individuals from previous personal and informal interactions. Initial trust levels provide insight on the state of the relationships existing between different stakeholders within the collaborative network.	[143]
Dimension	**Considerations**	**Description**	**Reference**
The healthcare facility/organisation	Stakeholder involvement	The involvement of crucial and diverse stakeholders is essential for successful value creation as it allows for the healthcare facility/organisation to see its role and function from a larger	[143]

		perspective. Diverse approaches should be used to successfully bring together different stakeholder groups based on the vision, goals and strategies of the facility/organisation.	
	Engagement guidelines	Engagement guidelines provide a basic structure to manage and orchestrate the way in which communication takes place between different stakeholder groups.	[143]
	Alignment of values and interests	Differing values between stakeholder groups pose a threat to the relationship between the stakeholders as these relationships can possibly be destroyed or can even be prevented from even forming. The failure to identify and properly align interests and values can severely damage the performance of the facility/organisation.	[138]
	Information and knowledge sharing	Sharing and exchange of up-to-date knowledge and information involves distributing information for systems, organisations and people. To enhance the results of information sharing the following four questions should be addressed: (1) what should be shared? (2) who should it be shared with? (3) how should it be shared? And (4) when should it be shared? The quality of the answers will help healthcare facilities in reducing redundancy, reduce the cost of sharing information and ultimately improve the responses.	[147]
	Resource availability	Resources are necessary requisites to build the facility/organisation's value creation capacity. Limited resources are often the main hindering factors to the success of value creation and can be linked to low frequency of communication and interactions between stakeholders.	[105]
	Interoperability	Interoperability allows for meaningful and reliable use of information within the public healthcare facility/organisation through the use of information systems which ultimately encourages data quality and consistency. The full potential of interoperability may be realised through the user's (i.e. healthcare workers) adoption and acceptance of information systems.	[143]
Dimension	**Considerations**	**Description**	**Reference**
Co-creation	Open culture	Stimulates the facility/organisation's readiness and preparedness to co-create value. It is the backbone of the facility/organisation and plays a strategic role in how the facility/organisation adapts to changes. Open culture means that the facility/organisation should be: (1) open to its environment, (2) promote cooperation in its environment, (3) be open to new knowledge and changes, and (4) ensure free formation of relationships with all relevant stakeholders.	[145], [148]
	Open resources	Resources are the basic factors that determine the facility/organisation's success in the age of complex health facility/organisation environments. Open resources are important as they encourage the network of resources and the integration of activities.	[141]
	Open knowledge	Open knowledge results from the solid foundation of open culture and open resources. Occurs when everyone has free access to knowledge to be able to use it, modify it and share it.	[141], [21]

	Healthcare facility openness	Refers to the actions within the primary healthcare facility that open the facility up to its environment through transparency, access to knowledge and information, and collaboration. These actions are based on open culture, open resources and open knowledge.	[141], [21]
	The ability to reduce the impact of the complexity of the health facility/organisation environment	The facility/organisation needs to be able to reduce the impact of the complex environment to increase the certainty of its activities and ability to exploit opportunities emerging in the environment. The complexity of the environment refers to the interdependent and interconnected entities that facilitate the healthcare facility/organisation and include: stakeholders, technology systems and the facility/organisation structure.	[141], [124]
	The strength of the relationship that the facility has with its stakeholders	It is vital for the facility/organisation to strive to build stronger relationships with its stakeholders to reduce the impact of the complex environment. The goal of strengthening this relationship is to reduce the sensitivity of the facility/organisation to changes occurring in the environment.	[141], [70]
Dimension	**Considerations**	**Description**	**Reference**
Stakeholders	Readiness and ability to participate in value co-creation	Participating stakeholders must be prepared to interact with one another through direct interactions for value co-creation. If wrongly or ineffectively used, value destruction can take place, or in the best case there may be no significant impact.	[141]
	Symbiotic relationships	The symbiotic relationship formed between participants supports value logic. It is vital to understand these interrelationships and dependencies that arise between participants to understand how value is created and delivered within the healthcare ecosystem.	[21], [111]
Dimension	**Considerations**	**Description**	**Reference**
Value outcomes	Compatibility of co-creation variables	Value co-creation is driven by the relationships between participants, the environment and the healthcare facility itself. These variables determine the readiness of the facility/organisation to co-create value within its ecosystem. These variables need to be compatible to successfully co-creation value.	[129]
	Measured value	The value created within the facility/organisation is a measure of the success of the value creation system and can also serve as an indicator of the success of value co-creation in the facility/organisation. By measuring the value created in the facility/organisation, action can be taken for further improvement.	[141]
	Sources of value	It is vital to identify and understand the different sources of value that emerge in the ecosystem. These sources of value are necessary in order to understand value logic in an ecosystem and how value is and can be co-created in the ecosystem.	[141]

	Quality of knowledge that is used, modified and shared	Using, modifying and sharing quality knowledge accelerates innovation within the ecosystem. Quality knowledge is a necessary outcome of value creation as it allows for disparate elements of knowledge to be identified and used in cohesive ways.	[21]

5.5 Chapter 5 summary

In this chapter, the preliminary conceptual framework was developed. Each of the dimensions of the framework were discussed with the importance considerations for each highlighted. This was based on the key findings from the scoping review and the conceptual literature review. The framework presents a holistic system-perspective of the value creation process by focusing not only on the ecosystem actors level but also on the ecosystem level. This chapter forms the first step towards the development of the conceptual framework and is evaluated in Chapter 6 by investigating the Netcare value proposition.

Chapter 6: Framework evolution Part 2: Theoretical evaluation of preliminary conceptual framework

6.1 Introduction

Chapter 6 presents Part 2 of the framework evolution where the preliminary framework was evaluated by means of a theoretical case study on Netcare's value creation initiative. The chapter begins with a discussion of the South African healthcare system to gain insight on its components and how it functions. The theoretical case study is presented and discussed following this. The case study formed the preliminary evaluation of the framework and was used to assess the adherence of the framework to the standards of an existing value creation initiative. This differs to the practical case study conducted in Chapter 8 which intended to investigate and understand how the healthcare system functions as an organisation in order to relate this back to the framework. This evaluation process was followed by semi-structured interviews with industry experts and applying the framework to an industry-based case study in the chapters to follow. The modifications and adaptations made to the framework are discussed at the end of the chapter.

Chapter 6 objectives:

- Give a theoretical background on the South African healthcare system
- Provide a theoretical background on Netcare's value creation initiative
- Evaluate the preliminary framework against Netcare's value creation initiative
- Present the modifications and adaptations made to the framework

6.2 The South African healthcare system

Significant interventions are needed to enhance communication between providers, increase medical knowledge, reduce decision conflict, and improve diagnosis and treatment [128], [146]. This section investigates the South African health system in an attempt to better understand how an information system should be used to create value within a healthcare system.

6.2.1 Brief overview of challenges affecting eHealth implementation in South Africa

Since ANC inherited the fragmented healthcare system in 1994, service delivery has remained a pressing challenge that the South African government has had to face at all levels [146]. The recent history of South Africa's health policy tells a story of poorly made decisions that have put the country in a throes of colliding epidemics. These epidemics, which include HIV, Tuberculosis (TB), various fast growing non-communicable diseases and maternal deaths have resulted in mortality, suffering and the expenditure of scarce resources [146].

South Africa's rising burden of diseases is attributable to alcohol abuse, high body-mass index, high blood pressure and unsafe sex [150]. South Africa also has persisting social disparities and shortages of health practitioners who are needed to provide care for the growing population [151]. In order to Implement an eHealth system in the context of South Africa, specifically in primary health care, the consideration of these challenges and various additional aspects is required. These aspects include: the user population, the environmental demands, and the implementation challenges in rural areas. Challenges in rural areas result from unreliable access to electricity and shortages of technicians and highly trained health workers [152]. Furthermore, it is important to understand that improvements will only materialise if these systems are customised to align with the needs and challenges of the local practitioners in resource-poor areas [149], [152].

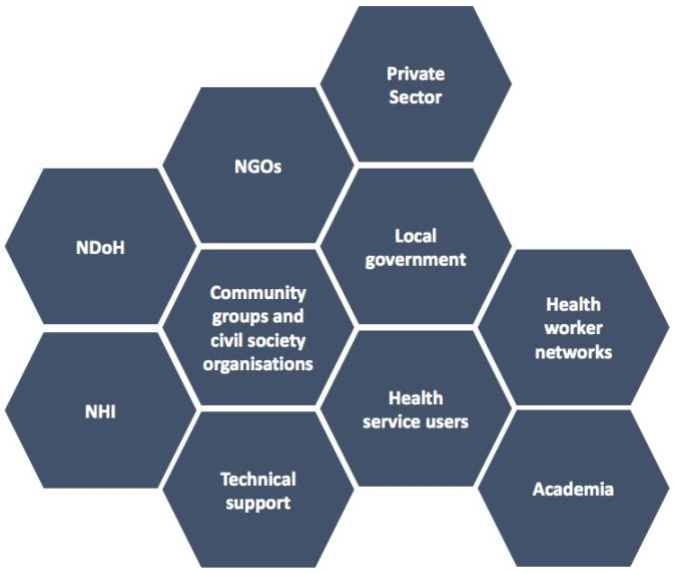


Figure 6.1: Overview of South African healthcare stakeholder groups [154]

6.2.2 The healthcare system

A well-functioning healthcare system that is efficient, effective and equitable consists of six building blocks which include: leadership and governance, information systems, financing, medical products, human resources and service delivery. These building blocks enable the realisation of the improvement of the health status of individuals, equitable access to care, efficiency and responsiveness. Therefore, coherent investment in these building blocks is needed to keep the health system on track to provide services that produce desired results [152].

The healthcare system consists of information-intensive activities that produce large quantities of data from laboratories, wards, operating theatres and primary care organisations [153]. Management of this information is needed across systems and organisations through collaboration, portability and integration [148]. In the view of these contingencies, information systems have become a method used to: (1) manage knowledge, (2) create transparency, (3) promote evidence-based decision making and (4) ensure good governance in the healthcare system [148]. It is therefore important to standardize Information Systems and to ensure that they are semantically interoperable [154]. Semantic interoperability as defined by the National Health Information Network, is "*the ability to interpret, and, therefore, to make effective use of the information so exchanged*" [148]. Semantic interoperability is necessary to support the collaboration across platforms and systems [148].

In order for the efforts of eHealth to be realised there needs to be a collaboration across diverse stakeholder groups [145]. This means engaging all actors in meaningful policy dialogue to establish a consensus on the values, goals and overall policy direction that will drive the healthcare system [18]. Figure 6.1 gives an overview of the stakeholder groups in a healthcare system in South Africa. The multiplicity of stakeholders involved in the healthcare system forms the premise for value creation and co-creation [155]. Value co-creation elucidates the importance of patient engagement in healthcare at the micro-level. Exploring value co-creation through patient engagement at this level enhances opportunities for collaboration initiatives at the meso- and macro-levels [81]. Value and what it actually means to patients at the micro-level needs to be understood in order to gain insight into strategies that promote engagement and co-creation in the healthcare system [81].

As an initiative to contribute towards integrating the health system, the National Department of Health (NDoH) developed the National Digital Health Strategy for South Africa 2019-2024 [81]. The aim of the strategy is to develop an integrated digital health ecosystem of people, processes and technology

to strengthen and support efficient service delivery, effective patient care and person empowerment in order to achieve Universal Health Coverage [18]. The strategy promotes and prioritise active engagement of stakeholders at all levels to establish, maintain, facilitate and implement the envisioned digital health ecosystem [18]. Despite the potential to improve the digital health system, the adoption of eHealth has been slow due to factors which include: high initial cost, resistance to change, security and privacy concerns, and lack of technical skills. In addition, the fragmentation of the health information systems is an obstacle that affects the ability of health information systems to interoperate which worsens this slow uptake of eHealth [18], [156]. Interconnectivity and interoperability are a big challenge in healthcare as entities continue to operate independently. This affects the ability to make efficient and prompt decisions in disparate health information systems [157].

6.3 Theoretical evaluation: The case of Netcare

The purpose of this section is to provide an initial evaluation of the preliminary conceptual framework by relating it to an existing value creation initiative within the South African healthcare context. This evaluation process also served to provide insight into the important concepts that were overlooked by researchers during the development of the framework. Theoretically evaluating the framework using the Netcare case study resulted in an improved understanding of a value creation system in South African healthcare context which subsequently led to the modification and adaptation of the preliminary conceptual framework. The Netcare case study was chosen based on the following reasons:

- The operational context of the initiative (South African health)
- The availability of information on the initiative
- The scale of the value creation initiative

Three aspects were focused on during the investigation as they related to the preliminary conceptual framework. These aspects included: (1) the value creation approach, (2) the implementation and adoption of information technology systems, and (3) creating value for stakeholders.

The data gathered for the case study consisted of publicly available information about Netcare which was found through document searches on the internet. Due to this being the primary source of data collection that was used, its limitations were acknowledged. The search for the data and the subsequent data analysis was guided by the preliminary conceptual framework and its components. A background on the Netcare group is provided in the following section.

6.3.1 Background on Netcare value creation initiative

The Netcare Group considers itself to be a leading private healthcare provider in South Africa that provides acute services that span across a national network of hospitals. The group provides additional services in areas which include: emergency care, cancer care, primary care, renal care, occupational health and wellness services, and also mental health services [158]. The Netcare group endeavors to achieve high quality across their uniquely integrated ecosystem of services by using a model that integrates patients, people and partners in the value chain. Their aim is underpinned by activities which are intrinsic to their purpose, values and promises. Netcare's value creation initiative involves connecting complex relationships and managing scarce resources for the delivery of services. The quality of these relationships is determined by the management of their approaches and processes which are enabled by digitisation and data [158].

6.3.1.1 The strategic approach for value creation

Netcare aims to create value by providing effective, efficient and high quality healthcare by trying to: (1) develop its people, (2) improve its systems and processes and (3) eliminate harm and waste in all areas where operations are conducted [158]. Netcare's value creation strategy is integrated into their business model, presented in Figure 6.2, which includes the consideration of inputs, activities in the value chain, strategic priorities and key outcomes [159]. The model is underpinned by a

governance philosophy that supports the creation of measurable value for stakeholders both in the healthcare sector and in society [159].

Netcare disrupts its traditional operating model, which focused on acute episodes of care, by implementing a value creation initiative that fosters a culture of participatory healthcare. Netcare does this with the aim to create person-centered healthcare that is digitally enabled and data driven. Person-centered healthcare is aligned with the social trends pertaining to people's demands for greater choice, greater personalisation and greater convenience. This continuum of healthcare involves not only putting individuals at the center of everything but it also involves seeing individuals as partners who are encouraged to actively participate in managing their own health care needs [158].

Figure 6.2: Netcare's Business model [158], [159],

Netcare considers a Quadruple Aim framework, developed by the Institute for Healthcare Improvement, as a foundational principle of their strategic approach. The objective of the Quadruple aim is to balance the value of Netcare's services with their cost to society while recognising the fundamental role of the people and the partnerships needed to achieve this balance [158]. This is done by using a collaborative approach across all activities performed by the enterprise to coordinate governance, management systems, and the healthcare services provided by Netcare [159]. The Quadruple Aim framework is shown in Figure 6.3.

Figure 6.3: The Quadruple Aim framework developed by the Institute for Healthcare Improvement [127]

The Quadruple Aim framework is used to optimise the performance of Netcare's healthcare systems for the purpose of creating value. This is done by focusing on: (1) quality leadership, (2) people management, (3) continuous business improvement and (4) environmental sustainability [159]. These focus areas guide Netcare towards achieving the integrated objectives in a sustainable manner while still driving long term competitiveness and growth [159]. In regard to quality leadership, the framework is integrated into the operations of the enterprise in order to guide the enterprise in delivering the best possible clinical outcomes. Furthermore, the framework places emphasis on the management of skilled staff in order to build a collaborative culture within the organisation for the purpose of creating quality care. The staff members are central to the value proposition of the enterprise and are therefore provided with ongoing development, training and support. The Quadruple Aim informs the continuous improvement initiatives of business processes to drive efficiencies through digitisation. This is intended to improve quality time spent with patients and to enhance cost management practices. The environmental sustainability strategy considers the need to secure critical utilities such as water and energy while still containing the costs and reducing the environmental impact [159].

6.3.1.2 Implementation and adoption of information technology systems

Technology has revolutionised and continues to revolutionise the way in which healthcare is managed and delivered. Together with the implementation of information technology systems, Netcare improves its business programs by including centralising and streamlining processes. These advancements strengthen the relationship that the enterprise has with its patients, healthcare specialists and funders. The mutually beneficial outcomes that arise from these relationships enhance quality of care, reduce risk and improve cost effectiveness [158]. To become a digitally enabled enterprise, capital investment is needed to secure reliable and effective information technology. Change management interventions are also required for the effective implementation and adoption of information technology systems by stakeholders, particularly doctors to ensure that the investment in information technology achieves the intended objective [159]. Netcare's ability to deliver profitable growth and therefore sustainable value creation is dependent on the digitisation of the way they do things in order to achieve efficiencies in an environment where the cost of growth is lower than the increase in input costs [158].

Netcare differentiates itself from its competitors based on the implementation of its Electronic Medical Records (EMR) solution, formally titled CareOn, across all its service platforms. This approach forms the backbone of the person-centered healthcare that enterprise offers. The

approach is intended to improve their operating efficiency and manage expenses through achieving improved clinical outcomes, reducing clinical risks and providing doctors and patients with mobile access to medical records [159]. The CareOn approach focuses on data management and analytics with the intended aim of extracting maximum value from data to inform the development of new products and services [158]. Netcare prepares its employees for the implementation of the CareOn approach through a change management plan. The plan is intended to drive the acceptance of change and to develop resilient skills that are needed to ensure the successful implementation of the solution. The plan includes: (1) recruiting clinical application support specialists to assist employees with the transition; (2) providing awareness sessions and training for employees; (3) conducting a readiness survey to gage the level of preparedness, attitudes, understanding, acceptance and commitment to the new solution; (4) developing a new organisational design; and (5) conducting an emotional impact session both before and after the implementation of the solution.

6.3.1.3 Creating value for stakeholders

Netcare's aim to deliver the best and safest care to its patients requires the management of a complex range of critical and mutually beneficial relationships with its stakeholders. Netcare's key stakeholders include: patients, employees, regulators, governments and communities, specialists, primary healthcare providers and allied healthcare professionals, investors, suppliers and funders [158]. These stakeholders were identified and are prioritised by the enterprise based on two considerations. Firstly, the extent of the influence that the stakeholder has on business' activities is considered together with the impact they have on the outcomes of these activities. Secondly the business' ability to mitigate risks associated with each relationship it forms with its stakeholders is also considered. [159]. To support these relationships in the long term, Netcare aims to: (1) clearly communicate their strategic priorities; (2) have well-defined roles and expectations; (3) consistently engage in and support interactions that are relevant and that are underpinned by appropriate measurement tools; and (4) implement governance and report best practices [158].

Netcare uses an integrated and collaborative approach across all of its service platforms to support and manage the range of critical relationships it has with its stakeholders [160]. The quality of the relationships that the enterprise has with its practitioners, funders and suppliers have a direct impact on Netcare's ability to deliver the highest quality and person-centered care to its patients. The quality of the relationships that Netcare has with regulators, government and communities protects the enterprise's commercial and social licenses to operate. Furthermore these stakeholders determine Netcare's ability to effectively increase access to quality healthcare [158].

Stakeholder engagement strategies are used by the enterprise with the aim of ensuring that quality relationships with their stakeholders are upheld through proactive, regular and transparent engagement. These strategies empower stakeholders and further encourage innovation, critical thinking, continuous development and learning [158]. Netcare uses varying engagement channels to engage with the different stakeholder groups. The engagement channels provide rich information on the business' performance with the intention of: (1) building strong partnerships with stakeholders; (2) recognising and learning from facilities that excel; and (3) identifying activities that work well and identifying areas that need improvement [158]. The engagement channels used by Netcare include: web-based and telephonic facilities, patient feedback systems, real-time surveys, performance reviews, grievance mechanisms, change management workshops and initiatives and intranet sites and internal newsletters [160]. Table 6.1, on the next page, presents the varying engagement channels that exist between Netcare and its stakeholders. The table also highlights the value that Netcare proposes and promises for each of the stakeholder groups.

Table 6.1: How Netcare creates value for its stakeholders [158], [159]

Stakeholder group	Stakeholders considered	Stakeholder engagement channels	Value proposition for stakeholders
Patients	Patients which include: medically insured, public, self-paying, foreign government-funded and indigent.	• SMS, • Patient experience follow-up email, • Patient focus groups, • Listening forums.	• Access to quality healthcare and medical technology, and specialized holistic treatment for specific conditions, • Delivery of quality clinical care, • Quality experience, • Continuous patient engagement, • Highly qualified and dedicated doctors.
Employees	Nurses, paramedics, pharmacists, management and administration teams, IT specialists, facilities management teams and contract staff.	• Quarterly national consultative forums, • Leadership roadshows, • The Employee Wellness program and quarterly employee communication forums, • Transformation committee meetings, • Diversity dialogues and workshops, • Toll-free line to anonymously report discriminatory behavior.	• Caring work environment with high-performance culture, • Investment in training, and professional and career development, • Safe clinical environment that enables delivery of the highest standards of care, • Maintaining proactive and constructive relationships with workforce unions, • Comprehensive employee wellness programs that develop resilience to change.
Regulators, Government and Communities	Authorities in the healthcare system, public sector partners, communities, sponsorship partners and non-profit organisations.	• Direct engagement with SA government officials and regulators at various levels.	• Inform health policy through independent research and engagement with policymakers, • Collaborate with government to find solutions that extend access to quality healthcare in SA, • Programs that promote access to healthcare for disadvantaged communities.

Specialists	Specialists of varying clinical disciplines.	• Physician advisory board meetings,
		• Profiling which facilitates engagement activity activities.
			• Ensure optimal clinical outcomes through:
			  ○ Quality management systems,
			  ○ Collaboration,
			  ○ Aligning business operations with Quadruple Aim,
			  ○ Quality staff support and efficient use of advanced medical, equipment, consumables and medicine,
			  ○ Optimal facility infrastructure,
			• Training sessions, forums, and continuous professional development.

Primary healthcare providers and allied healthcare	GPs, dentists, radiologists, pathologists and therapists.	• Council meetings to address medical and dental issues, • Physician Advisory boards and the Netcare Clinical Ethics Committee meetings.	• Providing appropriate medical equipment enabled by effective IT systems, • Managing and monitoring clinical practices, • Training sessions, forums, and continuous professional development.
Funders	Insurance, the Compensation for Occupational Injuries and Diseases in SA.	• Day-to-day interventions on patient case management, • Regular engagement with funders on issues such as quality outcomes, patient experience and doctor utilisation trends, • Contract and tariff negotiation meetings.	• Patient satisfaction, • Optimise clinical pathways to manage the utilisation of resources and improve outcomes, • Share quality data through collaboration, • Automate processes to improve efficiencies
Investors	Shareholders and the investment community.	• Presentations, road shows and conferences, • Regular discussions between the investment community and management, • Online and annual reporting.	• Calculated investment to manage and grow the business for sustainable returns and capital growth.

Suppliers	Medicine related companies, equipment and consumables, IT systems, professional and outsourced services.	• Regular interactions and review sessions, • Tenders and requests for proposals, • Conferences and exhibitions, • Supplier audits, • Contract negotiations. • Online supplier surveys.	• Fair and transparent tender processes, • Contractual terms that support suppliers' businesses, • Unique procurement practices, • Enterprise and supplier development initiatives to advance businesses and drive better performance.

6.3.2 Assessing the preliminary framework against Netcare's value creation initiative

The nature of the preliminary framework was developed to be as generic as possible. Therefore, it was important to refine the framework's concepts, based on the themes of Netcare's value creation initiative. This was done by firstly gaining a better understanding of Netcare's service platforms, as was done in the preceding sections, and secondly by linking the preliminary conceptual framework to aspects of Netcare's value creation initiative. These aspects included [160]:

- Patient-centered healthcare
- Operational management systems
- Digitally enabled ways of working
- Data driven environment
- Sound corporate governance practices (internal controls promote awareness to risk, compliance and good governance)

The preliminary framework is made up of three levels which include: the political and economic environment of the health system, the healthcare facility and the primary stakeholders. These levels form the dimensions of the framework in addition to the co-creation dimension and desired value outcome dimension. The inventory of concepts in which the framework is composed of were evaluated to assess their conformability by mapping them against Netcare's value creation initiative as presented in Table 6.2. Concepts that conformed to Netcare's value creation initiative were marked with a tick with a description of their connection to one or more aspects of Netcare's value creation initiative also provided. Based on Table 6.2, the majority of the concepts included in the framework could be related to Netcare's value creation initiative. Certain concepts could not be linked to Netcare's value creation initiative as a result of: (1) limited available information regarding the internal functioning of Netcare operations; and (2) the difference in strategies between the framework Netcare's value creation initiative.

Table 6.2: Preliminary evaluation of the framework

Framework dimensions	Preliminary framework concepts	Netcare's value creation initiative	Connection of framework concepts to aspects of Netcare's value creation initiative
Political and economic environment	Funding and support system	✓	Conforms to governance practices and aspects of Netcare's operational management systems
	Political support and buy in	✓	Conforms to aspects of operational management systems
	Regulatory standards/ guidelines	✓	Relates to governance practices and aspects of Netcare's operational management systems
	Incentives	✓	Conforms to aspects of the operational management systems
	Healthcare uncertainty	✓	Linked to Netcare's operational management systems
	Information asymmetries	Could not be linked to Netcare's value creation initiative due to limited available information regarding the internal functioning of Netcare operations	
	Initial trust levels	Could not be linked to Netcare's value creation initiative due to limited available information regarding the internal functioning of Netcare operations	
The healthcare facility/ organisation	Stakeholder involvement	✓	Linked to patient-centered healthcare and data driven environment
	Guidelines	Could not be linked to Netcare's value creation initiative due to difference in strategies	
	Alignment of values and interests	Could not be linked to Netcare's value creation initiative due to difference in strategies	
	Information and knowledge sharing	✓	Linked to data driven environment and digital aspect
	Resource availability	✓	Relates to operational management aspects
	Interoperability		Relates to the governance aspect of Netcare's initiative
Co-creation	Open culture	✓	Linked to patient-centered healthcare, data driven environment, operational management aspect and governance
	Open resources	✓	
	Open knowledge	✓	Relates to operational management aspects and data driven environment

	Healthcare facility openness	✓	Conforms to operational management practices, data driven environment and patient-centered healthcare
	The ability to reduce the impact of the complexity of the health system environment	✓	Relates to operational management aspects, digital and data driven environment
	The strength of the relationship that the healthcare facility has with its stakeholders	✓	Linked to patient-centered healthcare, and data driven environment
Stakeholder	Readiness and ability to participate in value co-creation	Could not be linked to Netcare's value creation initiative due to difference in strategies	
	Symbiotic relationships	Could not be linked to Netcare's value creation initiative due to difference in strategies	
Value outcomes	Compatibility of co-creation variables	Could not be linked to Netcare's value creation initiative due to difference in strategies due to limited available information regarding the internal functioning of Netcare operations	
	Measured value	✓	Conforms to aspect of the operational management systems
	Sources of value	Could not be linked to Netcare's value creation initiative due to limited available information regarding the internal functioning of Netcare operations	
	Quality of knowledge that is used, modified and shared	✓	Linked to data driven environment
Concepts from Netcare's value creation initiative		Preliminary framework	**Connection of Netcare's value creation initiative to aspects of framework concepts**
Change management		Gap in framework	Relates to operational management aspects
Environmental sustainability		Gap in framework	Relates to operational management aspects
Data management		Gap in framework	Linked to data driven environment and governance practices
Engagement channels		Gap in framework	Linked to operational management aspects and data driven environment
Elements of the Quadruple Aim		Gap in framework	Relates to operational management aspects

While the objectives of the preliminary framework and Netcare's value creation initiative are similar, the difference lies in their value creation strategies. This is particularly evident in aspects that are present in the framework but are not addressed by Netcare's initiative. These aspects include: engagement guidelines, alignment of interests and values, readiness and ability to participate in value co-creation and symbiotic relationships. Netcare's value creation initiative acknowledges the importance of the involvement of crucial stakeholders in the value creation process and the importance of forming relationships with these stakeholders. However, the initiative focuses mainly on interactions between the Netcare group and its stakeholders, as opposed to interactions occurring between the healthcare facility and its stakeholders as well as across the diverse stakeholder groups themselves as suggested in the proposed framework.

6.4 Modification of the framework

Changes were made subsequent to the assessing the conformability of the framework to an existing value creation initiative. The changes included incorporating additional concepts into the framework and reconstructing the framework. These modifications form part of the first part of the evaluation process for the framework and are discussed in detail in the sections that follow.

6.4.1 Concepts added to framework

From the data that was gathered and compared to the preliminary framework it was clear that there are additional aspects that are of importance that need to be considered in the value creation process. All concepts that were added to the framework were done so at the healthcare facility level of the framework. The first addition to the framework was a change management intervention. A thorough Change management intervention is necessary to drive acceptance of changes in the healthcare system. Furthermore, change management practices help to develop resilient skills that are needed to ensure the successful implementation of strategic initiatives [158]. The second addition to the framework included the consideration of environmental sustainability. This is an important strategy that is intended to secure critical utilities such as water and energy while still managing costs and reducing the environmental impact of the healthcare facility [158]. The third addition to the framework was a data management initiative to oversee the governance, coordination and protection of data. Including data management in the framework is aimed at extracting maximum value from data for the purpose of informing the development and improvement of services [158]. The fourth addition to the framework was that of engagement channels. The purpose of including engagement channels in the framework has to do with the importance of managing the complex range of critical relationships which is achieved through communication, defining roles and expectations, consistently engaging in relevant interactions and implementing best practices [158]. The final addition to the framework was a Value Creation Aim (VC Aim) that adopted the core elements of the Quadruple Aim, developed by the Institute for Healthcare Improvement. The reason for this lies in the significance of using such a tool in the value creation process as it optimises the performance of the healthcare system through the integration of objectives and the alignment of processes which is the premise of the Quadruple Aim [158].

From the preliminary evaluation it was evident that the majority of the themes of the framework relate to the themes of a successful value creation initiative. This essentially highlighted the framework's potential as a tool that could be used in a developing country healthcare system. This evaluation provided a starting point for tailoring the preliminary conceptual framework specifically to the context of a South African healthcare system. The evaluation proved that the framework could provide useful insight that should be considered in the design and management of a value creation system.

6.4.2 Reconstruction of framework

The theoretical insight obtained during the preliminary evaluation of the framework led to the reconstruction of the framework structure in addition to the concepts that were added to the framework in the previous section. This came as a result of having a better understanding of how a value creation initiative functions. The three levels of the framework were changed to form

subcategories of three new categories which are: input, strategic priorities and activities, and output as seen in Figure 6.4. The framework was reconstructed to form a feedback loop that includes these categories and subcategories to encourage and support continuous growth, development and improvement of healthcare systems. As seen in Figure 6.4, the VC Aim is placed at the end of the feedback loop. The purpose of this is to ensure that the value created is firstly measurable and secondly that it adheres to these aims. Therefore, in this sense, the VC Aim serves an indicator in the framework as it tracks the success of the value creation system.

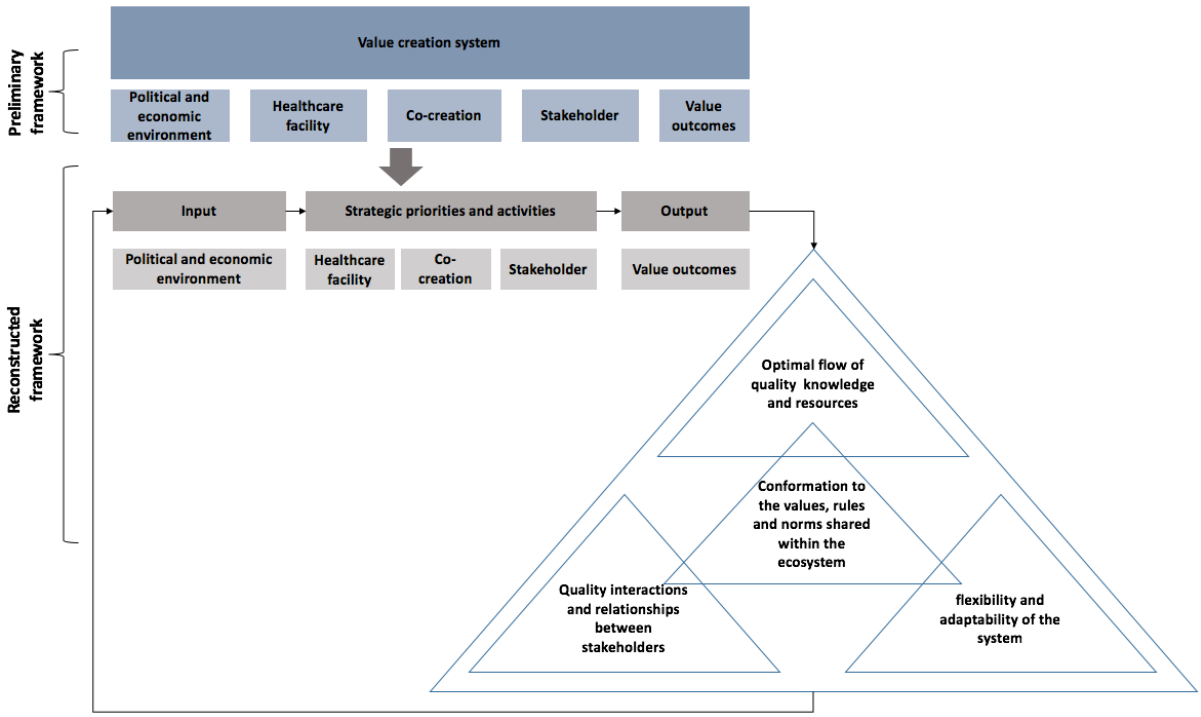


Figure 6.4: Reconstructed framework

Drawing from the FMT investigation in Section 4.5, the analysis from the scoping review in Chapter 3 and the conceptual literature review in Chapter 4, additional indicators were added to the framework. These indicators were added to the framework at the healthcare facility level to track the readiness of a healthcare facility to implement the co-creation concept. The concept is one that emphasizes the need for active collaboration between stakeholders mediated by information systems for the purpose of creation value [158]. Collaboration between diverse stakeholder groups is an ongoing initiative and process that has not definite end [63], [141]. It is a process that supports businesses in their efforts of having a competitive advantage and to drive innovation. Therefore, the degree at which a business advances in its ecosystem is heavily dependent on its co-creation activities [141]. These indicators were added to the framework to drive the progression of the value creation system in addition to the VC Aim of the framework. This addition to the framework is intended to stimulate thoughts and simultaneously guide the value creation process. Table 6.3 presents the reconstruction of the co-creation dimension, included in the preliminary framework, into the respective levels that are intended to be used to assess the readiness to co-create.

Table 6.3: Levels to determine readiness to co-create [139]

Level	Healthcare facility openness	Ability to reduce the impact of environmental complexity	Strength of relationship with full range of stakeholders
LEVEL 1: The facility is barely ready to use co-creation concept	**Open culture is at a weak-moderate level with no open resources and no open knowledge:** The facility has full control over decision making process, low level of information sharing, little contribution from stakeholders	**Poor:** Highly sensitive to environmental changes within the health system, little flexibility and ability to quickly adapt to changing environmental conditions	**Weak:** Relationships formed with limited stakeholder groups with little understanding of needs and expectations of full range of stakeholders
LEVEL 2: The facility is partially ready to co-create	Open culture is at a moderate level with open resources at a weak moderate level with no open knowledge: Limited stakeholder contribution, the facility still largely in control of decision making process	**Reasonable:** Slow to respond to changing conditions and needs of the health system environment, modern concepts are often built but plans are seldom realised	**Moderately weak:** sufficient relationships formed with limited stakeholder groups with some understanding of needs and expectations of stakeholders
LEVEL 3 Facility is mostly ready to use co-creation concept	**Open culture and open resources are both at a moderate high level with open knowledge at a low level:** Narrow and targeted cooperation of stakeholders in decision making process, limited boundaries with significant sharing of information	**Good:** Adequate flexibility and ability to adapt to changing conditions, moderate operational efficiency to translate modern concepts into actualised activities	**Moderately strong:** Close relationship with targeted stakeholder groups with a good understanding of the needs and expectations of the stakeholders
LEVEL 4: The facility is ready to implement the co-creation concept	**Open culture, open resources and open knowledge are all at a high level:** Full cooperation from stakeholders, collaborating parties completely open to learning and gaining new knowledge that is	**Excellent:** Very little sensitivity to changes in the health system environment, highly flexible and quick to adapt to changing conditions, full operational efficiency to translate strategies into processes, systems and structures	**Strong:** Symbiotic relationships with the full range of stakeholders are forged to facilitate co-creation through co-specialized and complementary inputs from stakeholders

	free to access, modify and share, and using it to implement innovative changes.		

Level 1 is the simplest form of value co-creation where the facility has full control over the decision making process. At this level only open culture is at a moderately weak level resulting in the lowest level of information sharing through contribution from stakeholders. There is little known about the needs and expectations of the stakeholders at this level and therefore little mutual understanding between the entities [21], [70], [129], [141], [161]. The facility therefore becomes highly sensitive to environmental changes for this reason which affects its ability to translate strategies into processes, systems and structures. At this level the facility's inability to respond to unexpected situations that may arise [141].

At Level 2 the facility still implements a high degree of control, structure and boundaries on its decision making process however at this level there is a better understanding of needs and expectations of stakeholders through the procurement of their contributions. This ultimately results in the elevation of service quality and therefore the value created improves [141]. Level 3 is where the facility starts to rely significantly on the input of its stakeholders. This level mainly focuses on the innovation of services where the advancement of these services is dependent on the level of involvement of the stakeholders [141]. Level 4 involves the most active engagement of the four levels and is defined as a completely open environment with the highest levels of open culture, open resources and open knowledge [141]. The nature of interrelationships between stakeholders results in the seamless engagement and cooperation between collaborating parties at this level [141]. Each collaborating participant is open to suggestions from other participants and actively uses open resources. Participants are therefore completely open to learning and gaining new knowledge that is free to access, modify and share for the purpose of using it to implement innovative changes. The concept of symbiosis is used to explain this interdependence as individuals interact with one another in a sympathetic manner in the ecosystem [141], [161].

6.5 Chapter 6 Summary

Chapter 6 mainly focused on assessing the compliance of the preliminary framework against an existing value creation initiative. Netcare's value creation initiative was related to each of the themes of the preliminary framework and subsequently additional concepts that were seen to be of importance were added to the framework. The framework was then reconstructed based on gained theoretical insight. Chapter 6 formed the preliminary evaluation of the framework. Interviews with industry experts and an industry case study were used to further evaluate the framework in the chapters to follow.

Chapter 7: Framework evolution Part 3: Semi-structured interviews with subject matter experts

7.1 Introduction

In this chapter, semi-structured interviews formed the second part of the evaluation process. The aim of the conducting the semi-structured interviews was to evaluate the categories and concepts of the framework and to gain additional insight. The outcomes from conducting the interviews along with thoroughly examining the interview data was an evaluated and adapted framework. The framework was transformed from a one-dimensional framework consisting of three categories and subcategories into a three-dimensional framework consisting of canvases specific to the South African health context.

Chapter 7 objectives:

- Provide a brief discussion on the interview structure selected
- Describe the process followed to conduct the semi-structured interview
- Analyse the data collected from the interviews
- Present the findings from the interview data
- Highlight modifications made to the framework based on insight gained from the interview data
- Present and discuss the modified and adapted framework

7.2 Semi-structured interviews

Qualitative interviews are flexible and powerful tools that aid in capturing people's voices and help to make meaning of people's perceptions and experiences. Interviews used in qualitative research differ based on the approach undertaken by the interviewer and the nature of the research questions and research design [162].

Semi-structured interviews were chosen as the most appropriate method to conduct interviews during the development of the research. This was largely due to their explorative but still structured nature. Semi-structured interviews helped to ensure that the interview style was consistent which was important as several interviews were conducted. The approach helped to ensure that the specific areas of focus were addressed using a set of subject themes to guide the interview.

7.2.1 Interview protocol

An interview protocol was used to guide the interview process, as suggested by Creswell [54]. The protocol was planned and developed by the researcher to ensure that the interviews were limited to a time of one hour. Before conducting the interview, the researcher obtained ethical consent for participation from the interviewee. Ideally, these discussions would be held in person however due to COVID-19 restrictions, interviews were conducted using online platforms, telephonically and using questionnaires. Each method that was used to gather data offered the interviewee a concise overview of the research topic, the aim of the framework and background on the purpose of the interview/questionnaire. Experts that were interviewed by means of an online platform were presented with this information using a PowerPoint presentation on a computer. Interviewees who chose to be interviewed telephonically or by means of a questionnaire were sent this briefing via email before the commencement of the interview.

During the development of the questions, a problem arose due to the many concepts distributed between the three ecosystem levels that needed to be validated. To address this problem, in order to adhere to the time constraint set for the interviews, the researcher used the two strategic categories, discussed in Section 5.2 to develop questions. These categories, namely functions and structural components, comprise the full spectrum of concepts which fall under the six development

parts used to formulate the framework. The six development parts include: (1) governance, (2) co-creation, (3) information and knowledge sharing, (4) external environment, (5) organisations/institutions and (6) stakeholders. The questions developed were therefore linked to the development parts of the framework. The guiding questions used to conduct the interviews can be found in Appendix B.

The governance mechanisms questions related to the foundation of the value creation design, development and implementation which considered how value creation is realised in the ecosystem. Questions pertaining to co-creation, referred to how collaborative networks are used to cultivate value co-creation and improve practices and institutional development. Information and knowledge sharing questions considered the management and use of information and knowledge to support the healthcare processes to create value. The external environment included questions that lead to a deeper understanding of the impact that the political, cultural and institutional factors have on the desired outcomes of the healthcare system, as the external environment is dynamic in nature and is continuously changing. Questions pertaining to the organisation referred to how healthcare organisations facilitate the development of collaborative networks through the use of information systems to bring together diverse stakeholders and knowledge types while providing a platform for value creation. Finally, the stakeholder questions related to understanding and learning more about the stakeholder and their individual context.

By using the six development parts as a roadmap to conduct the interviews, consistency was maintained in the interview process and quality information was gathered. This was important as this allowed for the interviews to be kept within the focus areas of the investigation. Furthermore, the guideline helped the researcher to ask questions that would probe the interviewee to touch on certain concepts that were thought to be of importance. This method of interviewing allowed for new insight to be gained and for voids in the framework to be filled.

The analysis of the information obtained from the interviews was enabled by voice recordings which each of the participants consented to prior to the commencement of the interviews.

7.2.2 Interviewee profiles

The researcher selected individuals to interview based on the need to gain different viewpoints and experiences from a diverse group of people. This helped the researcher to better understand how value is created in the South African healthcare context. The researcher reached out to seven industry experts however only four were willing to participate. These four participants were categorised into three different groups which include: experts in the various research fields, developer related and health related. These groups are presented in Table 7.1. Due to the background and level of expertise of the participants, some were categorised into more than one group. Certain interviewees were grouped as research experts in the fields which include value creation, ecosystem management and governance. The multidisciplinary nature of these interviewees provided the researcher with insight from a researcher perspective which helped to verify the concepts of framework from different viewpoints. The developer perspective allowed the researcher to gain insight from experts who have experience in developing governance structures and health national standards. The health related perspective provided the researcher with insight into the complexities of healthcare and health information systems.

Table 7.1: Interview groupings

Interview groupings	Reason for inclusion
Expert in research field	To verify the concepts of the framework from different viewpoints
Developer related	To gain insight on important components of a governance structure implemented in the South African healthcare context
Related to health	To gain insight on healthcare complexities, and health information systems

7.2.3 Data analysis process

Following the completion of the interviews, Creswell's approach [54] for analysing and interpreting data was used to make sense of the data gathered. Creswell's approach suggests segmenting the data into smaller parts for investigation and putting it back together again. This is achieved by using the six-step process, presented in Figure 2.6 in Section 2.8 for the analysis of qualitative data. The process was followed as it provides a structured approach for analysing and presenting data.

The interview questions were categorised into the six development parts, as was discussed in Section 7.2.1. This helped to simplify the structure of the data that was transcribed, as the data gathered from the interviews was easily divided into one of the six parts. Organising the data formed the initial step in the data analysis approach and consisted of developing a structured layout for the data on MS Excel to ensure consistency for each interview. Once the data was organised, it was briefly read through to get a general sense of the information. This was then followed by the commencement of the coding process [54].

Coding is a heuristic problem-solving technique that is essential for the data analysis process. It is an initial step that is needed prior to an even more rigorous and evocative analysis and interpretation of data [163]. The coding process is a cyclic act that manages, filters and highlights the salient features of the data for the purpose of categorising, grasping meaning and building theory from the data [163]. The act of coding requires the need of an analytical lens to interpret what is happening in the data. This lens is based on the type of filter used which affects how the data is perceived by the researcher [163].

The interview data was analysed to verify the concepts, detect patterns, categorise the data and to build theories. MS Excel was chosen as the tool used to code the data, as the researcher was familiar with its functionality. The coding process was divided into three sections: the first cycle, a hybrid cycle and a second cycle, as shown in Figure 7.1. The first cycle focused on determining whether the interviews validated the concepts included in the framework based on the perspectives and worldview of the interviewees. This was done by relating the interview data to the framework concepts. A hybrid cycle was incorporated to ensure that the data was sufficiently analysed by addressing the unique needs of the process. This cycle required the researcher to use analytical lenses, formulated based on the findings from the first cycle, to begin the process of understanding the findings and identifying additional concepts overlooked by the researcher. The final cycle yielded refined data that consisted of themes, patterns and deeper insight into the relationships and links between the data. The results and conclusions from each of the cycles are discussed in detail in the following section.

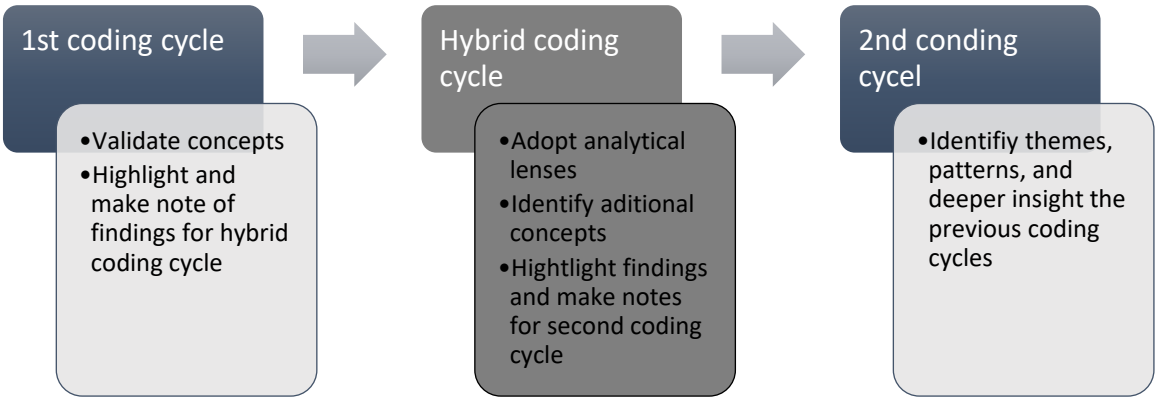


Figure 7.1: Coding cycles of interview data [162]

7.2.4 Results and conclusions

The results and conclusions drawn from the three coding cycles are presented and discussed in this section. This includes the validated concepts and categories, highlighted areas of disagreement, additional insight and the discussion of the identified themes and patterns that lead to the modification of the framework. A narrative approach is used to represent and discuss these findings, with the approach supplemented by graphs, figures and tables where appropriate.

7.2.4.1 First coding cycle

As discussed earlier, the interview outline was divided into six distinct parts to address the full spectrum of concepts in the framework to adhere to the interview time constraint. The approach for the first coding cycle was to go through all of the data gathered from the interviews and to mark which concepts were validated. The process was conducted for each of the interviews independently in MS Excel.

The data gathered from the interviews was formulated on MS Excel in a way that enabled the researcher to record the frequency at which each of the concepts were mentioned or discussed by the interviewees. These results are shown in Figure 7.2, Figure 7.3 and Figure 7.4. The data is presented in three parts using the categories of the framework, developed in Section 6.4.2, which include: input, strategic priorities and activities, and output. By displaying this data on a chart, trends and popular concepts were easily identified and interpreted.

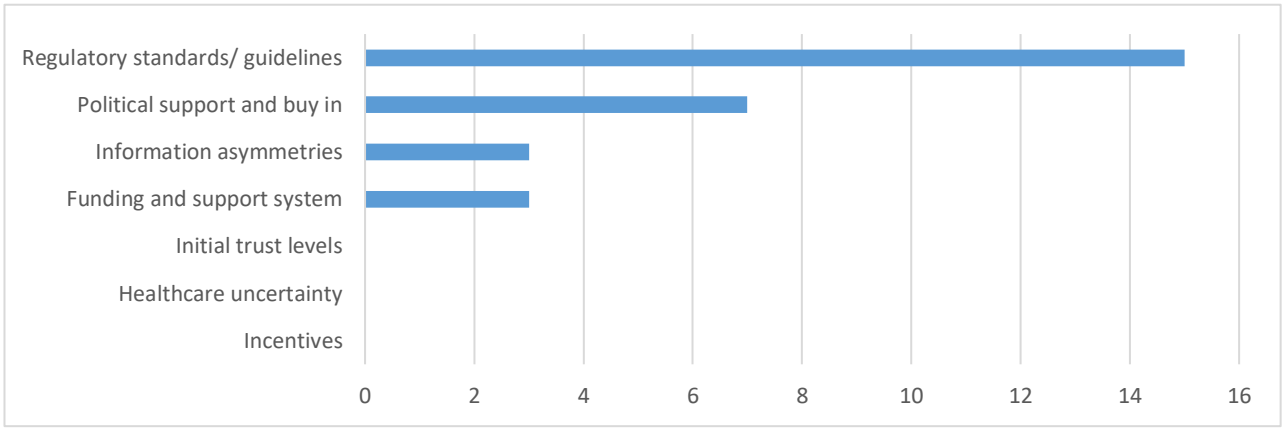


Figure 7.2: Mentions from the input category

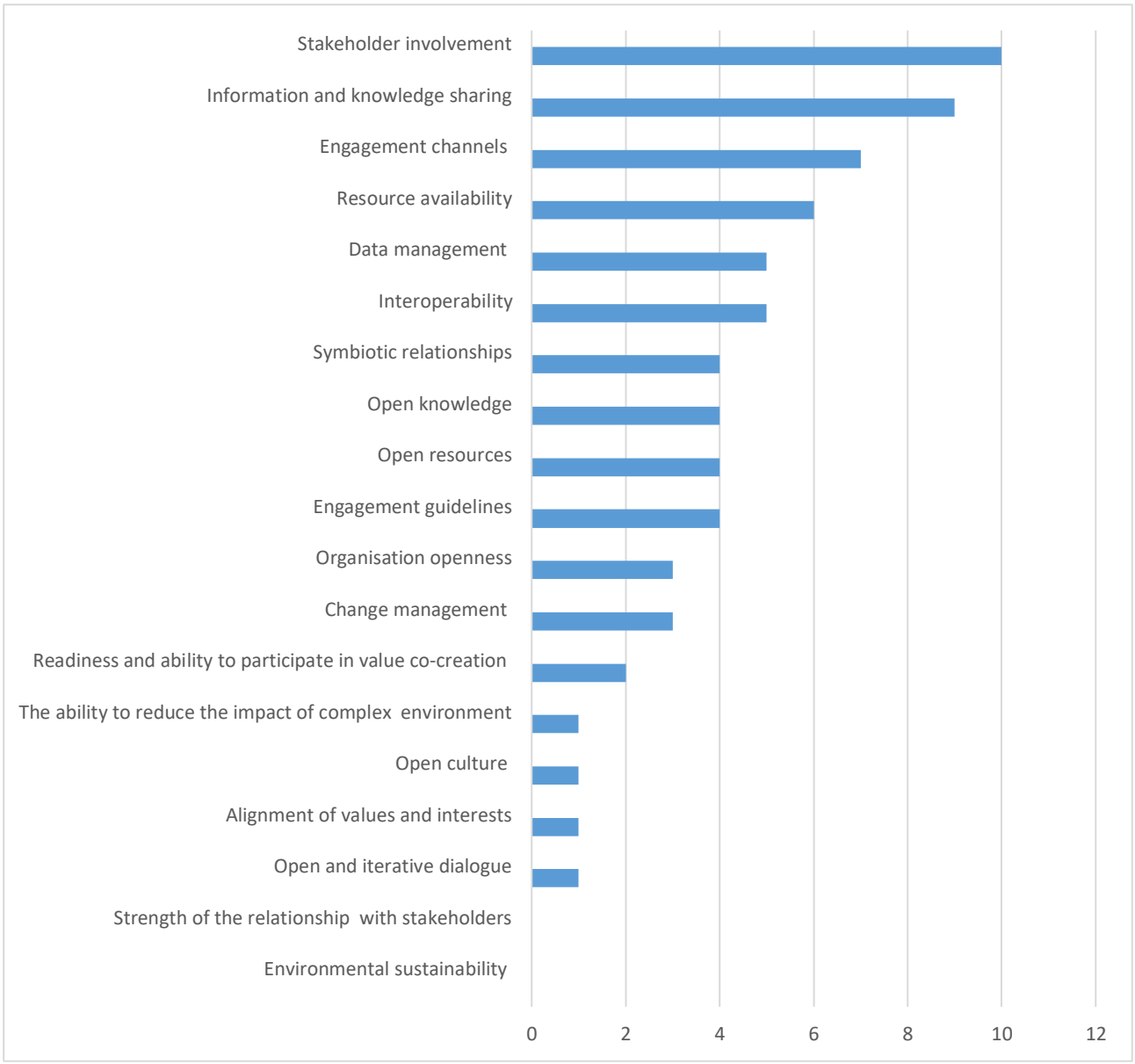


Figure 7.3: Mentions from the strategic priorities and activities

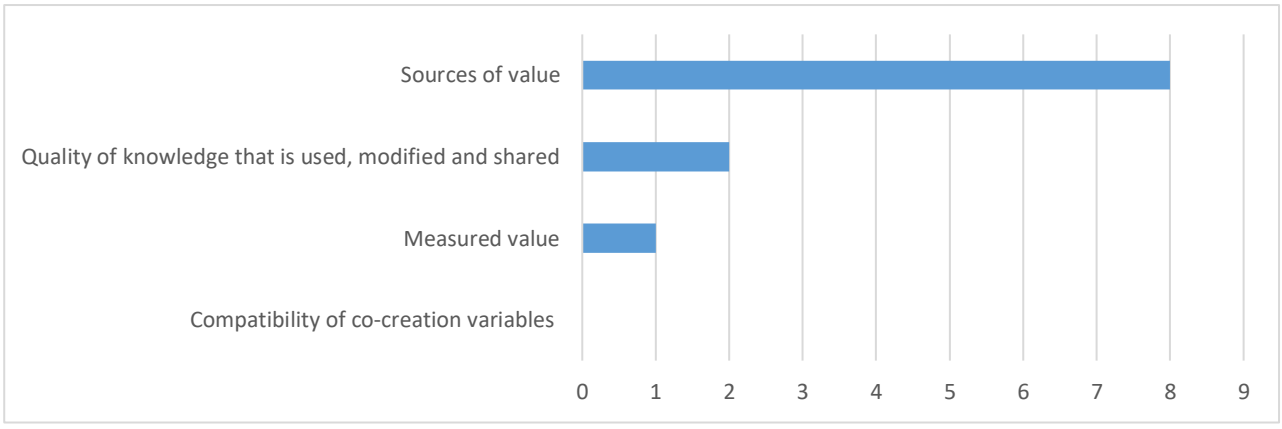


Figure 7.4: Mention from the Output category

In the input category, which comprised the external environment, it could be seen that four out of the seven concepts were mentioned or discussed across all the interviews conducted as shown in Figure 7.2. The concepts that were most mentioned amongst the interviewees, in descending order, were the regulatory standards/guidelines, political support and buy in, funding and support and information asymmetries. The popularity of these concepts lies in their significance and role in the healthcare system. Having political support, funding and following industry standards is mandatory in the health system context. A possible reason for the mention of information asymmetries by the interviewees has to do with the fundamental challenge of having stakeholders with differing levels of knowledge in the system and impact that it has on healthcare delivery. Without the consideration and inclusion of these concepts in the system, the chances of success are very limited.

The diverse nature of the interviewees influenced the distribution and relevance of the concepts. Not all concepts were relevant to all the interviewees. Concepts such as initial trust levels, healthcare uncertainty and incentives had very little significance to certain industry experts, for example. This was due to these concepts not being applicable in all value creation systems.

The strategic priorities and activities category consists of concepts pertaining to the healthcare organisation, co-creation and stakeholders as seen in Figure 7.3. Similar to the input category, there were no concepts that were discussed or mentioned by all interviewees for this category. The distribution of concepts in the figure aligns with the relative importance of the concepts as highlighted during the interviews. Stakeholder involvement, information and knowledge sharing, engagement channels, resource availability, data management and interoperability were amongst the popular concepts across the interviews. These concepts are considered to be crucial for value to be successfully created within a healthcare system. The remainder of the concepts mentioned by the interviewees were considered to be supporters of value creation that further increase the value that is created and experienced in the healthcare system. Similar to the input category, concepts that were not discussed by the interviewees such as the strength of the relationship that the healthcare organisation has with its stakeholders, and environmental sustainability, are not necessarily indicative of their irrelevance but rather indicate that such concepts are not always applicable to the process of creating value.

Finally, the output category consisted of concepts relating to the outcomes of the value creation process. The concepts that were mentioned during the interviews are shown in Figure 7.4 . The source of value, quality of knowledge and measured value were the popular concepts across the interviews. This was with a specific relation to the adaptation, evolvement and improvement of information systems within their ecosystem.

The validation of the concepts was successful with most of the concepts included in the framework mentioned and discussed in the interviews. Certain concepts however were not sufficiently validated while others were not validated at all by the interviewees. As mentioned previously, three concepts from the input category were not validated. The first concept is the initial trust levels which considers the strong network ties built on trust formed between stakeholders. The second is the healthcare uncertainties which relates to the effect that healthcare uncertainties have on the long-term sustainability of a healthcare system. The third concept is the incentives which relate to the reward structures put in place to encourage and recognise improvements of healthcare services.

Within the strategic priorities and activities category, two concepts were not validated. The first concept is the strength of the relationship that the healthcare organisation has with its stakeholders. This concept considers the influence of the strength of these relationships on the flexibility and the adaptability of the healthcare system as well as the ability to make better and more informed decisions. The second concept is the environmental sustainability which pertains to the environmental impact of the healthcare organisation. Only one concept from the output category was

not validated. This concept was the compatibility of the co-creation variables. This concept regards the compatibility of the essential variables of value co-creation within a healthcare system.

Due to the way the interviews were conducted, concepts may have been overlooked during the interview process which could have been the reason why certain concepts were not validated or not sufficiently validated. For this reason, these concepts were kept in the framework for further evaluation in Chapter 8.

The researcher acknowledges that not all concepts carry the same weight or have the same impact when it comes to value creation. Future work could include an investigation on the importance of these concepts relative to one another to determine the actual weight of each concept in regard to value and its creation. It was made clear from the interviews as well as during this analysis that certain concepts differ in importance based on the healthcare perspective considered. This therefore necessitates a perspective to be set prior to the use of the framework.

7.2.4.2 The hybrid coding cycle

A hybrid coding cycle was incorporated into the coding process discussed in Section 7.2.3 to ensure that the data gathered from the interviews was thoroughly investigated. This involved the use of four analytical lenses, derived from notes highlighted in the first coding cycle. The four analytical lenses included: (1) health, (2) sub-Saharan Africa (SSA), (3) governance, and (4) stakeholder involvement. These lenses, presented in Table 7.2, were identified as they were frequently emphasized throughout the reading of the data and were therefore used for further investigation.

Table 7.2: Analytical lenses adopted

Analytical lens	Description
Health information systems	Health information systems have different requirements and considerations compared to other information systems. Specifically, creating value through health information systems requires the consideration of data, security, accuracy and interoperability
SSA	The landscape of the healthcare system within which information systems operate specifically in sub-Saharan African countries.
Governance	Governance forms a fundamental role for achieving the national health policy objectives and is key for information system and ecosystem success
Stakeholder involvement	Value creation cannot be successfully achieved without stakeholder involvement. Collaborations that span the full range of relationships existing between stakeholders plays a significant role.

The four analytical lenses along with the six development parts, discussed in Section 7.2.2, were used in conjunction to: (1) identify additional concepts to incorporate into the framework and (2) to highlight areas of disagreement that surfaced. These aspects are presented in Table 7.3, where the interview data is related to one or more of the five overarching development parts. The development parts include the: (1) external environment, (2) organisation, (3) stakeholders, (4) co-creation, (5) information and knowledge sharing.

Table 7.3: Semi-structured interview results

Development part	Validated concepts	Additional insight	Disagreements
External environment	Politics and economics have a great impact on the outcomes of the healthcare system, as does political buy in.	The effect that corruption has on: access and affordability of healthcare, efficiency, policy and healthcare expenditure.	In public healthcare, only the patients, healthcare workers and government are allowed to play a role. No external investment is allowed
	There are standards that the health system needs to adhere to and aim to achieve.		
	Interoperability standards need to be adhered to support use of health information systems and to facilitate secure and seamless exchange of information.	Consideration of the role of decentralisation in the healthcare system.	
Organisation	Resources need to be available to ensure that the healthcare goals are met.	Creating sustainable value in healthcare within the context in which it exists.	
	Health system interactions between the entities and the rest of the ecosystem.		
	There needs to a consideration of the different sources of value.		
	Development of a structured approach for the adoption and implementation of changes.		
	Systems used in healthcare need to adhere to the standards and guidelines put in place otherwise they won't be of value to the healthcare organisation.		
	Consideration of value-in-context which conceptualises the dynamics of value within multidimensional networks.		

Stakeholder	Value is created for the beneficiaries (stakeholders).	The development of sustainable value propositions for each stakeholder group.	
	A collaborative approach towards stakeholders successfully achieving shared goals and creating value within the healthcare system.		
	The involvement of patients in the decision making process is important as they are the most important people in the value chain.		
Co-creation	Transparency facilitates co-creation between stakeholders in the healthcare system.	It is important to co-create with marginalised communities especially the illiterate and uninformed people.	Value is co-created at different scales, there is no instance where there is a single creation of information. Information by nature is co-created.
	Co-creation plays a role in an organisation's ability to adapt to changes in a relatively fast manner.	Consideration of the social dimension in co-creation, particularly in regard to differing cultures and different languages.	
	Co-creation brings in multiple perspectives to ensure that the process of co-creation is successful and of value by getting more than one perspective.		
Information and knowledge sharing	Information sharing through information systems streamlines the health system which is especially important in terms of service delivery.	In order for health information systems to function successfully they need to be: affordable, easy to use and easy to implement.	People who use information systems to share information are not always the people who get the value from it. The people who actually get value out of these systems is up-stream. The value experienced gets more and more the further away one gets from the point of use.
	Information systems are not currently playing a very large or effective role in the public health sector due to their poor implementation.	Data silos significantly contribute to interoperability challenges.	
	There is no value in information that cannot be shared.	Data quality is essential for the effective use of information systems.	

	Information and knowledge sharing improves communication and aids in the effective management of healthcare practices, resource allocation and resource flow.	Information evolves and new information may emerge over time and it needs to be reviewed to assess its significance before making any new changes.	
	Using information and knowledge to identify opportunities for value creation.		
	Sharing information and knowledge is necessary to get different perspectives in order to create value.		

Additional concepts

Additional concepts derived from the interview data were sorted and categorised accordingly in Table 7.4. Two additional documents, provided by Interviewee B, were also used to further inform the interview data and to identify additional concepts. The first document pertained to the dominant influential factors of co-creation and the second document was the first version of the National Health Normative Standards Framework for Interoperability in eHealth in South Africa. A total of 12 concepts were added to the framework, and are presented in Table 7.4 with the respective description and reference. These additional concepts form part of the framework modifications which will be discussed in the following section.

Table 7.4: Additional concepts from interview data

Framework dimension	Additional concept	Description	Reference
External environment	Corruption	Impact of corruption on the health system landscape, goals and desired results.	Interview data
	Healthcare reform	The impact of healthcare reforms – decentralisation, financing, and priority setting.	Interview data;
The healthcare organisation	Sustainable value	Creating sustainable value that sustains healthcare organisations within the context in which it exists.	Interview data
	Silos	The impact of silos on interoperability challenges, communication barriers and disjoint of healthcare organisation.	Interview data
	Quality of data produced from systems in organisation	The crucial role of data quality for the effective use of information systems and influence on information value.	Interview data
	Infrastructure	The foundation for information and knowledge exchange. This includes physical infrastructure, services and applications that underpin the healthcare system.	[164]
Co-creation	Stakeholder characteristics	Play an important role in the willingness of stakeholders to participate in the co-creation process. Willingness is affected by culture, level of education and language used.	Interview data, [165]
	Social and human capital	Social and human capital needs to be energised in order to create sustainable commitment with participants in minority positions.	Interview data, [165]
	Attitude towards stakeholder participation	The influence of averse attitude of healthcare officials towards participation of certain stakeholder groups.	[165]
Stakeholders	Sustainable value propositions	Development of sustainable value propositions for stakeholder groups.	Interview data
Value outcomes	Stakeholder satisfaction	The influence that the value creation process has on stakeholder satisfaction.	[165]

7.2.4.3 The second coding cycle

The second coding cycle yielded refined data that consisted of themes, patterns and deeper insight into the data that was built on the outcomes of the previous coding cycles. In the previous cycles, certain topics and concepts were continuously mentioned and discussed throughout the interviews and were identified as trends and patterns. These were trends and patterns that needed to be considered in the design and development of the value creation system in the South African healthcare context. These trends and patterns were categorised accordingly and are presented in Table 7.5.

Table 7.5: Trends and patterns from previous coding cycles

Category	Identified trend/pattern	Description
Governance	Healthcare standards, guidelines and protocols	Clearly define all the functions, activities, processes and structures of a healthcare system that need to be adhered to.
	Stakeholder Buy in	Involvement of stakeholders in the development of national documents.
	Implementation of standards, guidelines and protocols in the context of healthcare	Effective implementation practices to achieve intended strategic objectives and goals in healthcare.
Information systems	Information and knowledge sharing	The system should facilitate information and knowledge sharing in a certain format and under certain circumstances.
	Interoperability and standards	In order to harness the value of data in healthcare, information systems should be interoperable and stable.
	Value of information	Information should be accurate, reliable and up-to-date to increase its value.
	Adoption of information systems	Information systems should be easy to use and easy to adopt.
Co-creation	The aim of co-creation	The aim of co-creation differs between interacting stakeholders.
	The level of co-creation	Co-creation scales at different levels in the healthcare ecosystem.
	Types of co-creation influences	Co-creation is influenced by a variety of factors which can either support or hinder the process.
Healthcare context	The notion of a healthcare organisation	Healthcare is not an activity that has one type of action, healthcare organisations differ in scope and level.
	Design and implementation considerations, specifically in the context of South Africa	Designing and implementing systems in the South African healthcare context requires the consideration of varying constraints and complexities.
Stakeholders	Identification of stakeholders considered	Targeted stakeholders need to be identified as they vary a lot in the environment. This needs to be linked to value propositions.

The first trend/pattern that was identified in the interview data was governance and its role in the healthcare system. Various standards and guidelines exist throughout the healthcare system that are designed to manage the functions, activities, processes and structures of the healthcare system and its components. Involvement of relevant stakeholders in the decision making processes and

development of these standards and guidelines broadens the consensus on the most appropriate strategy for success. With the design of these standards and guidelines comes their implementation in the healthcare system. It is one thing to emphasize the importance of these standards but the crux of it lies in the ease and effective implementation of these standards and guidelines to ensure that the desired goals and objectives are reached.

The next set of trends identified related to information systems. This included: information and knowledge sharing, interoperability and standards, value of information and the adoption of information systems. Information and knowledge sharing is essential for: decision making, healthcare improvement, value creation and identifying value opportunities. The lack of information and knowledge sharing can be detrimental and possibly affect the success of the healthcare system. The system should therefore facilitate this distribution of knowledge and information in a certain format and under certain conditions. Interoperability and standards play a crucial role in information sharing. To harness the value of information and knowledge in the healthcare system, information systems should be interoperable. Interoperability provides the fundamental linkage and integration of information and knowledge in a way that enriches the healthcare data for better understanding and interpretation by the receiving party. The value of information and knowledge that is used and shared through these systems gets even more when it is accurate, reliable and up-to-date. To further harness the value of information, information systems must be stable. This means that information systems must encompass resilience in the face of disturbances that transcend the scope of known properties to ensure that that system doesn't fail or lose information. There is value in ensuring that information systems that are developed for the improvement of healthcare processes are in fact used. This means that information systems need to be adaptable in such a way that people can actually adopt it. This is achieved through simplicity, autonomy, localisation, ease of use and ease of implementation.

The following set of trends related to the co-creation aspect of value creation in healthcare. It was clear that the aim of co-creation differs between interacting stakeholders. Stakeholders have different agendas and want different things out of the co-creation process which greatly influences the outcomes of the process. While co-creation for some is intended to improve systems, processes and the overall experience and satisfaction of the patient, others may co-create for economic purposes. These individuals behave purely for the benefit of their own interest rather than that of the collective. This can result in issues that include the development of outdated systems or the development of systems that are not adapted to the circumstances or context of the facility. The level at which co-creation takes place also results in the aim of co-creation varying at each respective level. Co-creation can scale from a healthcare provider and a patient level to healthcare workers co-creating on one electronic health record which in turn can contribute co-creation at the provincial level and country level thereafter. There are a variety of factors that influence the co-creation process and its success thereof. These factors can be viewed as either hinderers of the process or supporters of it. In this sense these factors are considered to be 'two sides of the same coin'.

The final two trends that were identified related firstly to healthcare and secondly to stakeholders. Both these trends have a significant influence on the design, development and implementation of the value creation system. The notion of the healthcare organisation and what it encompasses needs to be emphasized as healthcare differs in scope and level. This is especially important in the South African healthcare context that requires the consideration of varying constraints and complexities. This will further assist in the identification of the relevant stakeholders that need to be considered as stakeholders vary healthcare environments.

7.2.5 Modifications made to framework

Several modifications that were derived from the evaluation process were made and applied to improve the framework. These modifications were inspired by the additional insight and disagreements highlighted in the interview data; the themes and patterns identified from the interview data; and from increased understanding gained from further investigation of certain concepts. The

modifications include: the addition of new concepts; amendments to existing concepts and dimensions; the removal of unsuitable concepts; and the reconstruction of the framework. The context of these modifications were divided into two types, namely conceptual and structural. The additional concepts included in Table 7.4 were categorised as conceptual modifications. Conceptual and structural changes that were made as a result of the researcher's increased understanding are referred to as 'logic' in Table 7.6. The most notable modifications that were made are presented in Table 7.6 with the respective motivations or descriptions and reference(s) for each change provided.

Table 7.6: Framework modifications

Type	Modification	Motivation or description	Reference(s)
Conceptual	Addition of several concepts.	Various concepts were added to the framework.	Additional insight from Interview data
	Redefined and refined concepts.	Several concepts were redefined and refined.	Additional insight and disagreements from interview data
Structural	Added a first page canvas, as the first overarching dimension, to establish the notion of the healthcare facility and stakeholder profile. Name this the Pre-use canvas.	Prior to the use of the framework, the notion of the healthcare facility and its stakeholders should be determined as it affects the interpretation of the framework.	Additional insight from interview data
	Added information systems as a standalone concept in the framework.	A better and more in-depth understanding of the influence of these interfaces inspired the new arrangement.	Logic
	Added the functions and structural components that formed development parts of the framework as the second overarching dimension. Name this the tool guideline	Use of the development parts of the framework to provide a more in-depth description of the framework prior to its use.	Logic
	Redefined the value creation system (the initial framework) as the third overarching dimension. Name this the ecosystem canvas	Following the addition of the first and second overarching dimensions, the third overarching dimension was added to complete the new value creation system.	Logic
	Rearranged the third overarching dimension (the initial framework).	Rearrange the framework to represent the intended interpretation.	Insight from interview data, Logic
	Added key defining questions and implications to the first overarching dimension.	Defining questions and implications were added to provide a better understanding of the notion of the healthcare facility and its stakeholders.	Additional insight and disagreements
	Tailored the second and third overarching dimensions to fit the South African context.	The is based on the interview data and the intended purpose of the framework to be applicable in the SA health context.	Additional insight

The resulting tool consisted of three overarching dimensions that each have their own canvases. The first two overarching dimensions consist of canvases that are intended to be used prior to the use of the framework. The first dimension, the Pre-use canvas was established to define the healthcare system and its stakeholders. The second overarching dimension, the tool guideline, was developed to explain each of development parts of the framework. The third and final overarching dimension consists of the ecosystem canvas which is the rearranged framework that presents the value creation process. The evaluated and adapted tool is discussed in detail in the section that follows.

7.3 Overview of evaluated and adapted management tool

The evaluated and adapted tool follows from the theoretical case study on Netcare's value initiative and evaluation of the framework's concepts with industry experts. The resulting tool consists of three overarching dimensions which are presented in Figure 7.5. These dimensions, in a legible size, are presented at the end of this chapter.

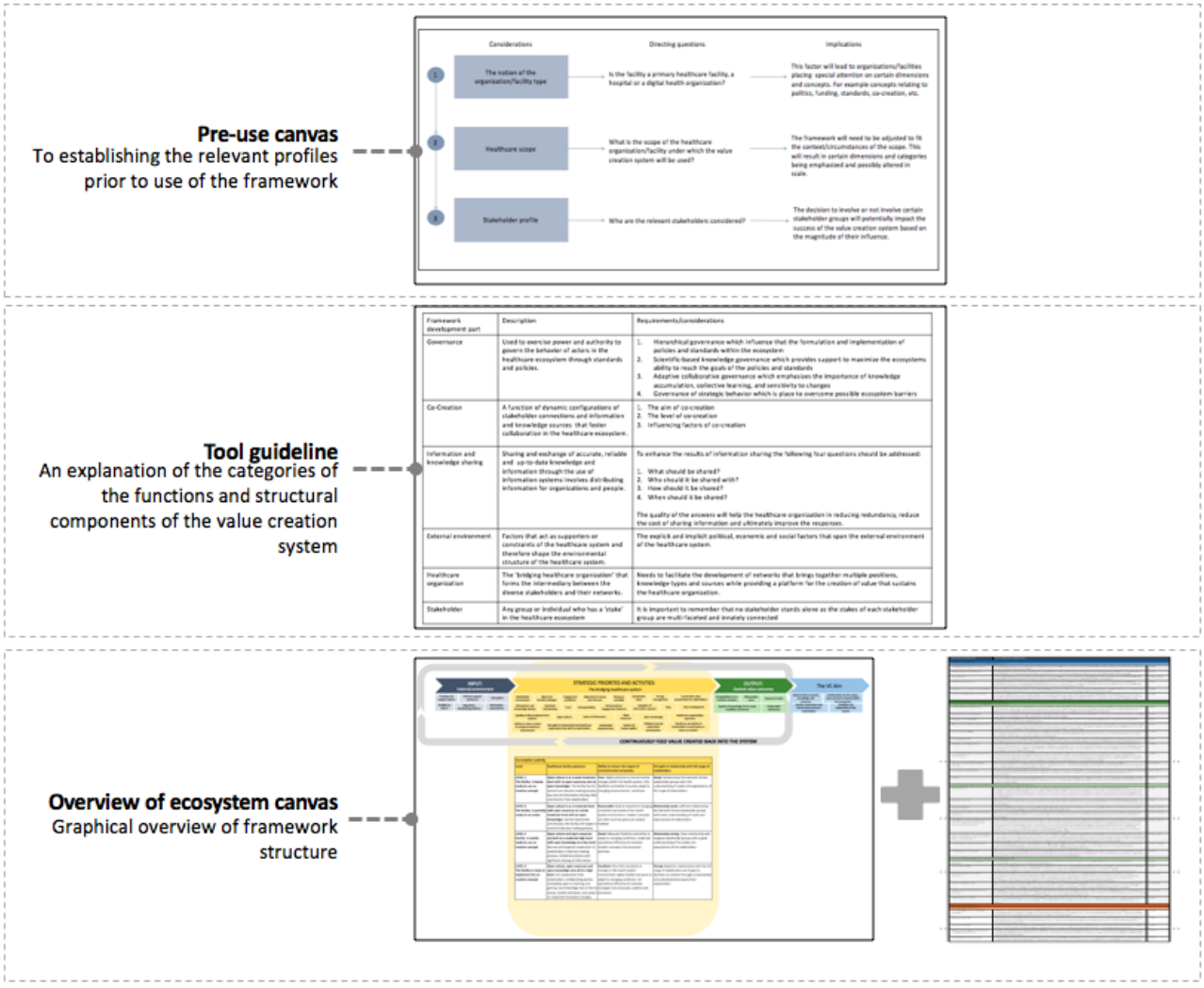


Figure 7.5: Overview of the overarching dimensions of the resulting framework

7.3.1 Dimension one: The Pre-use canvas

The purpose of the Pre-use canvas is to highlight the importance of establishing the notion of the

healthcare system, healthcare scope and the stakeholder profile prior to use of the framework. By establishing these three factors, the lens and the approach towards the framework and its concepts can be determined. The canvas uses directing questions to establish these aspects and also explains the potential implications on the framework use and its interpretation. Table 7.7 presents the content of the Pre-use canvas.

Table 7.7: Content of Pre-use canvas

Considerations	Implications
The notion of health system type	This factor will lead to the system placing special attention on certain dimensions and concepts. For example concepts relating to politics, funding, standards, co-creation, etc.
Healthcare scope	The framework will need to be adjusted to fit the context/circumstances of the scope. This will result in certain dimensions and categories being emphasized and possibly altered in scale.
Stakeholder profile	The decision to involve or not involve certain stakeholder groups will potentially impact the success of the value creation system based on the magnitude of their influence.

7.3.2 Dimension two: The tool guideline

The tool guide presents six value creation development categories, namely governance, co-creation, information and knowledge sharing, external environment, healthcare organisation and stakeholder. These categories encompass the functions and structural components of the value creation system. The first three categories are considered to be functions of the system while the last three are considered to be the structural components of the system. Governance is the first function of the value creation system and it refers to the actions and rules used to govern the healthcare system. This forms the foundation of the design, development and implementation of the value creation system. The second function is co-creation and it refers to the dynamic configuration of entities in the healthcare ecosystem that foster collaboration. The third function is information and knowledge sharing which relates to the exchange of quality information and knowledge through the use of information systems. This category highlights the need to consider: what information should be shared; who it should be shared with; how it should be shared; and when information should be shared.

The structural components form the overarching levels of the value creation system in which last above mentioned categories are integrated. The external environment forms the first category under structural components and it refers to the external influences that shape the healthcare system. The second category is the healthcare organisation, which aims to facilitate the creation of sustainable value. The final category is the stakeholder category which refers to the group or individual who has a ‘stake’ in the healthcare ecosystem. Stakeholders and their influence are considered to play a large role in the success of the value creation system.

7.3.3 Dimension three: The ecosystem canvas

The ecosystem canvas, that was formulated using the six development parts discussed above, was structured into three main categories, namely the input, strategic priorities and activities, and the output. It is important to note that in the ecosystem canvas, governance, information and knowledge sharing, and stakeholder development parts do not stand alone and are integrated into one or more of the categories as supporters/influences of the respective concepts. Each category of the ecosystem canvas highlights the key concepts that need to be considered in a value creation system in the South African healthcare context. The concepts included in the ecosystem canvas and their respective descriptions/implications are presented at the end of this chapter. As explained in Section

6.4.2, the ecosystem canvas forms a feedback loop to encourage and support continuous growth, development and improvement of the healthcare system. This is further reinforced by the VC Aim that is placed at the end of the feedback loop which serves to track the success of the value creation system and further drive the progress of the healthcare system.

7.3.3.1 The input

The input category relates to the external environment of the healthcare system. The external environment has a dynamic nature and greatly influences and shapes the healthcare system. In the South African context specifically the focus is on the influence that the different factors of the external environment have on the landscape and value creation process of the healthcare system. The most notable influences are included in the input category and should be considered as constraints or enablers of the healthcare systems ability to reach the desired healthcare outcomes. The main focus areas included as part of the external environment are funding and support, political support and buy in, corruption, healthcare reform, regulatory standards/guidelines, incentives, healthcare uncertainty, and information asymmetries.

7.3.3.2 The strategic priorities and activities

This category highlights concepts that should be considered regarding: (1) the properties of a value creating healthcare system; (2) factors influencing stakeholder involvement and co-creation success; and (3) factors influencing information and knowledge sharing. Concepts relating to the properties of a value creating healthcare system have to do with the healthcare organisation's responsibility to cultivate a collaborative environment. This type of environment provides a platform that brings together multiple stakeholders with varying positions and stakes to produce different types of knowledge in order to co-create value. In regard to stakeholder involvement, notable variables that influence stakeholder involvement, co-creation, and the healthcare organisation's readiness to co-create are considered. Factors influencing information and knowledge sharing includes concepts that relate to the standards, management, and value of information and knowledge.

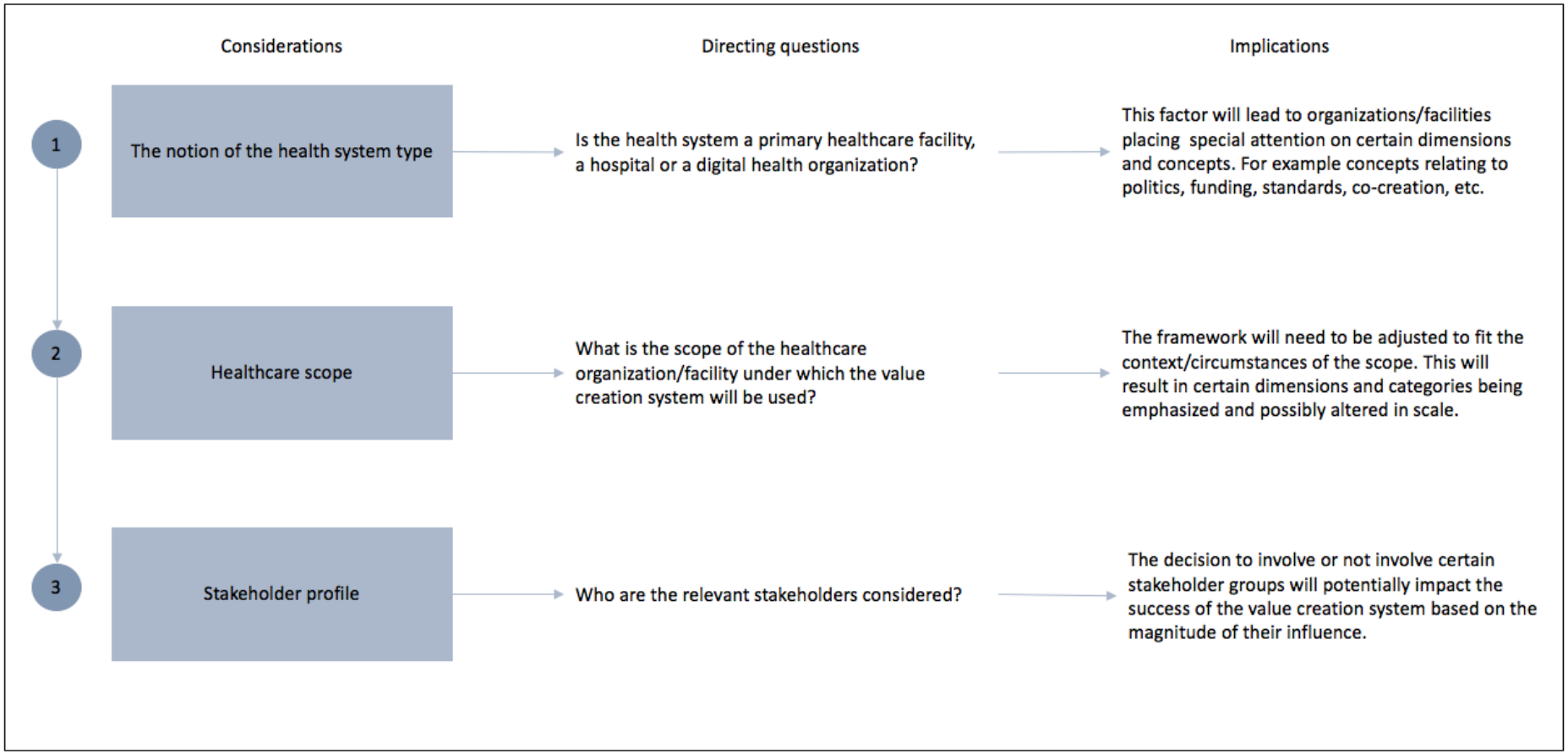
The three overarching concepts, that comprise the strategic priorities and activities, have an influence on the healthcare organisation's readiness to co-create. The co-creation matrix was included in the framework to assess this. The co-creation matrix consists of a layout that includes columns that refer to the components of co-creation and rows refer to the level of co-creation readiness. The intersections of the rows and columns result in 12 blocks which represent the healthcare organisation's co-creation efforts.

7.3.3.3 The output

The output category relates to the desired value outcomes of the system which result from measures of the external environment and strategic behavior of the healthcare organisation. The best outcomes of the value creation system include compatibility of co-creation variables, measurable value, sources of value, quality knowledge, and stakeholder satisfaction.

The evaluated and adapted management tool is presented next, after which the chapter is summarised.

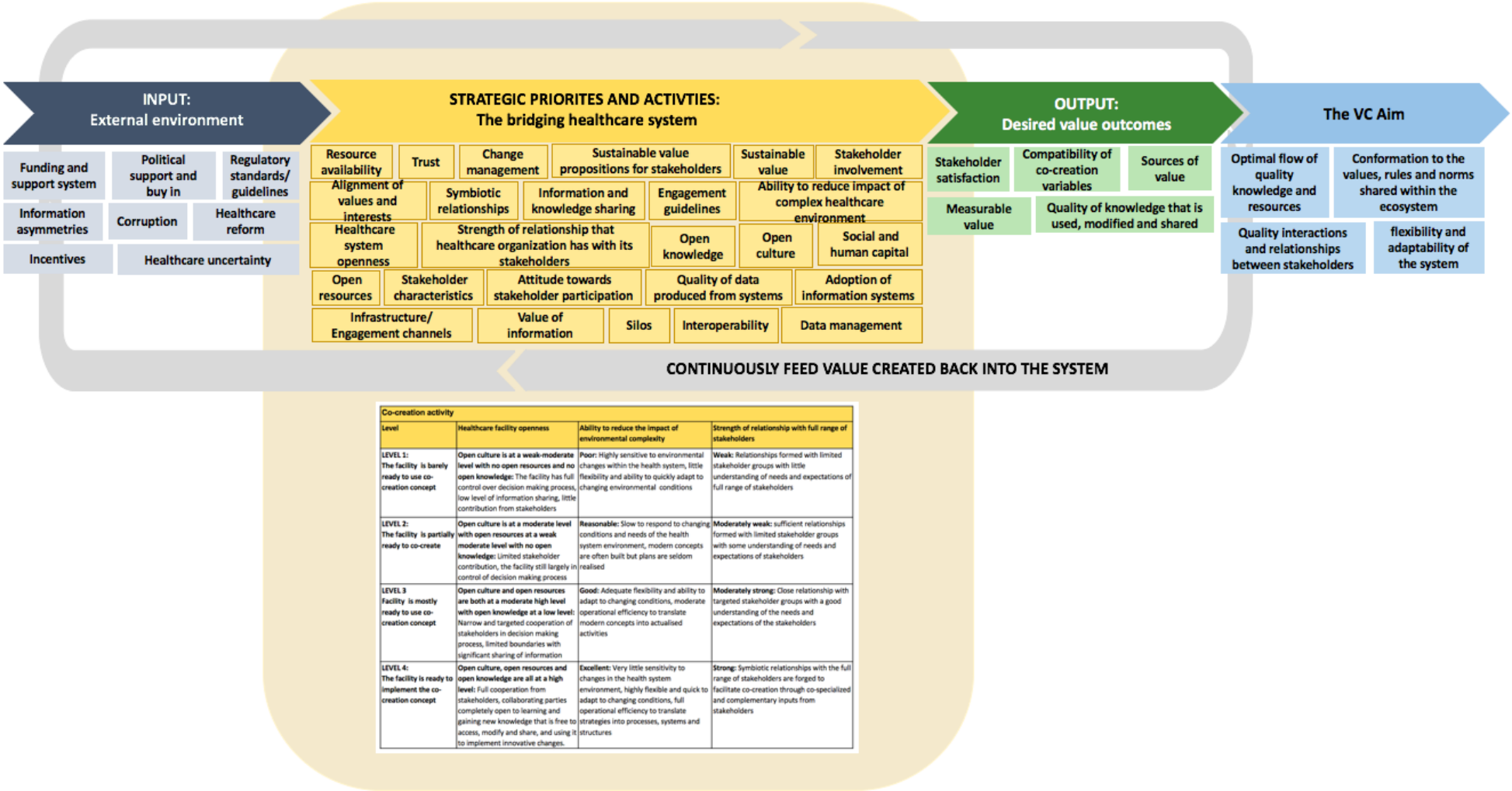
Dimension one: Pre-use canvas



Dimension two: Tool guideline

Framework development part	Description	Requirements/considerations
Governance	Used to exercise power and authority to govern the behavior of actors in the healthcare ecosystem through standards and policies.	1. Hierarchical governance which influence that the formulation and implementation of policies and standards within the ecosystem 2. Scientific-based knowledge governance which provides support to maximize the ecosystems ability to reach the goals of the policies and standards 3. Adaptive collaborative governance which emphasizes the importance of knowledge accumulation, collective learning, and sensitivity to changes 4. Governance of strategic behavior which is place to overcome possible ecosystem barriers
Co-Creation	A function of dynamic configurations of stakeholder connections and information and knowledge sources that foster collaboration in the healthcare ecosystem.	1. The aim of co-creation 2. The level of co-creation 3. Influencing factors of co-creation
Information and knowledge sharing	Sharing and exchange of accurate, reliable and up-to-date knowledge and information through the use of information systems involves distributing information for organizations and people.	To enhance the results of information sharing the following four questions should be addressed: 1. What should be shared? 2. Who should it be shared with? 3. How should it be shared? 4. When should it be shared? The quality of the answers will help the healthcare organization in reducing redundancy, reduce the cost of sharing information and ultimately improve the responses.
External environment	Factors that act as supporters or constraints of the healthcare system and therefore shape the environmental structure of the healthcare system.	The explicit and implicit political, economic and social factors that span the external environment of the healthcare system.
Healthcare organization	The 'bridging healthcare organization' that forms the intermediary between the diverse stakeholders and their networks.	Needs to facilitate the development of networks that brings together multiple positions, knowledge types and sources while providing a platform for the creation of value that sustains the healthcare organization.
Stakeholder	Any group or individual who has a 'stake' in the healthcare ecosystem	It is important to remember that no stakeholder stands alone as the stakes of each stakeholder group are multi-faceted and innately connected

Dimension three: The ecosystem canvas



Co-creation activity			
Level	**Healthcare facility openness**	**Ability to reduce the impact of environmental complexity**	**Strength of relationship with full range of stakeholders**
LEVEL 1: **The facility is barely ready to use co-creation concept**	**Open culture is at a weak-moderate level with no open resources and no open knowledge:** The facility has full control over decision making process, low level of information sharing, little contribution from stakeholders	**Poor:** Highly sensitive to environmental changes within the health system, little flexibility and ability to quickly adapt to changing environmental conditions	**Weak:** Relationships formed with limited stakeholder groups with little understanding of needs and expectations of full range of stakeholders
LEVEL 2: **The facility is partially ready to co-create**	**Open culture is at a moderate level with open resources at a weak moderate level with no open knowledge:** Limited stakeholder contribution, the facility still largely in control of decision making process	**Reasonable:** Slow to respond to changing conditions and needs of the health system environment, modern concepts are often built but plans are seldom realised	**Moderately weak:** sufficient relationships formed with limited stakeholder groups with some understanding of needs and expectations of stakeholders
LEVEL 3 **Facility is mostly ready to use co-creation concept**	**Open culture and open resources are both at a moderate high level with open knowledge at a low level:** Narrow and targeted cooperation of stakeholders in decision making process, limited boundaries with significant sharing of information	**Good:** Adequate flexibility and ability to adapt to changing conditions, moderate operational efficiency to translate modern concepts into actualised activities	**Moderately strong:** Close relationship with targeted stakeholder groups with a good understanding of the needs and expectations of the stakeholders
LEVEL 4: **The facility is ready to implement the co-creation concept**	**Open culture, open resources and open knowledge are all at a high level:** Full cooperation from stakeholders, collaborating parties completely open to learning and gaining new knowledge that is free to access, modify and share, and using it to implement innovative changes.	**Excellent:** Very little sensitivity to changes in the health system environment, highly flexible and quick to adapt to changing conditions, full operational efficiency to translate strategies into processes, systems and structures	**Strong:** Symbiotic relationships with the full range of stakeholders are forged to facilitate co-creation through co-specialized and complementary inputs from stakeholders

Enhanced co-creation matrix

Co-creation activity			
Level	**Healthcare facility openness**	**Ability to reduce the impact of environmental complexity**	**Strength of relationship with full range of stakeholders**
LEVEL 1: The facility is barely ready to use co-creation concept	**Open culture is at a weak-moderate level with no open resources and no open knowledge:** The facility has full control over decision making process, low level of information sharing, little contribution from stakeholders	**Poor:** Highly sensitive to environmental changes within the health system, little flexibility and ability to quickly adapt to changing environmental conditions	**Weak:** Relationships formed with limited stakeholder groups with little understanding of needs and expectations of full range of stakeholders
LEVEL 2: The facility is partially ready to co-create	**Open culture is at a moderate level with open resources at a weak moderate level with no open knowledge:** Limited stakeholder contribution, the facility still largely in control of decision making process	**Reasonable:** Slow to respond to changing conditions and needs of the health system environment, modern concepts are often built but plans are seldom realised	**Moderately weak:** sufficient relationships formed with limited stakeholder groups with some understanding of needs and expectations of stakeholders
LEVEL 3 Facility is mostly ready to use co-creation concept	**Open culture and open resources are both at a moderate high level with open knowledge at a low level:** Narrow and targeted cooperation of stakeholders in decision making process, limited boundaries with significant sharing of information	**Good:** Adequate flexibility and ability to adapt to changing conditions, moderate operational efficiency to translate modern concepts into actualised activities	**Moderately strong:** Close relationship with targeted stakeholder groups with a good understanding of the needs and expectations of the stakeholders
LEVEL 4: The facility is ready to implement the co-creation concept	**Open culture, open resources and open knowledge are all at a high level:** Full cooperation from stakeholders, collaborating parties completely open to learning and gaining new knowledge that is free to access, modify and share, and using it to implement innovative changes.	**Excellent:** Very little sensitivity to changes in the health system environment, highly flexible and quick to adapt to changing conditions, full operational efficiency to translate strategies into processes, systems and structures	**Strong:** Symbiotic relationships with the full range of stakeholders are forged to facilitate co-creation through co-specialized and complementary inputs from stakeholders

Adapted and modified ecosystem concepts of framework

Concept considered	Description/Implications	
The input category		
The external environment: influencing factors		
Funding and support system	Funding and support for administrative purposes as well as to create, monitor and facilitate the implementation and realisation of proposed plans and strategies.	[143], [165]
Political support and buy-in	Political support is necessary to address social needs. There is a great variation in these needs and actual delivery. Conflict and unequal interests need to be considered and overcome to ensure adequate governmental and civil service capability.	[143]
Corruption	Corruption is any form of abuse of power for personal gain. It contributes to weak governance as it affects health policy and spending priorities which in turn undermines the ability to achieve various social and developmental goals.	[166]
Healthcare reform	Changes and improvements in the healthcare system through governmental policies that affect healthcare delivery. Healthcare reform can be jeopardised when aspects such as poor management, poor governance, lack of accountability and unresponsiveness of the healthcare system are not properly addressed.	[167], [168]
Regulatory standards/guidelines	Carefully drafted, science-based knowledge constructed from components which include: policies, healthcare organisations and people. This knowledge forms the standards needed to ensure the delivery of important services.	[102], [146],
Incentives	Reward structures that are put in place to promote better performance in the healthcare system. Incentives may increase in instances where the achievement of the system's goals is dependent on the participation of stakeholders whose interests and values may differ.	[139], [143]
Healthcare uncertainty	Uncertainty can negatively affect the performance and commitment of actors within the healthcare ecosystem due the inability to gain full insight on all aspects of the ecosystem. This can be mitigated through the flexibility ecosystem and risk management techniques.	[143], [165]
Information asymmetries	Information asymmetries develop from power asymmetries that exist between individuals occupying different network positions. Results in participating parties having differing levels of knowledge and information. Information asymmetries can be reduced by addressing power asymmetries through collaborative processes.	[147]
The strategic priorities and activities category		
Properties of a value creating healthcare system		

Stakeholder involvement	The involvement of crucial and diverse stakeholders is essential for successful value creation as it allows for the healthcare systems to see their roles and functions from a larger perspective. Diverse approaches should be used to successfully bring together different stakeholder groups based on the vision, goals and strategies of the system.	[143]
Engagement guidelines	Engagement guidelines provide a basic structure to manage and orchestrate the way in which communication takes place between different stakeholder groups.	[143]
Alignment of values and interests	Differing values between stakeholder groups pose a threat to the relationship between the stakeholders as these relationships can possibly be destroyed or can even be prevented from even forming. The failure to identify and properly align interests and values can severely damage the performance of the system.	[138]
Resource availability	Resources are necessary requisites to build the system's value creation capacity. Limited resources are often the main hindering factors to the success of value creation and can be linked to low frequency of communication and interactions between stakeholders.	[105], [147]
Sustainable value	The creation of sustainable value involves carrying out healthcare services that sustain the healthcare organisation through the efficient use of resources. Sustainable value creation is multifaceted involving economic, social and environmental concerns.	[143]
Change management	Actions taken to ensure the smooth transition from the current state of the healthcare system to the desired future state.	[169]
Sustainable value propositions for stakeholders	The development of sustainable benefits, which can include social, economic and environmental benefits, for stakeholders.	[170]
Information and knowledge sharing	More conceivable when facilitated by information systems. However, relevant stakeholders need to be willing to participate in information sharing activities. The lack of information and knowledge sharing results in the ineffective coordination of actions and entities in the healthcare system.	[147], [169,171]
Symbiotic relationships	The symbiotic relationship formed between participants supports value logic. It is vital to understand these interrelationships and dependencies that arise between participants to understand how value is created and delivered within the healthcare ecosystem.	[105], [111], [21]
Trust	Trust built between participating individuals from previous personal and informal interactions. Trust levels provide insight into the state of the relationships existing between different stakeholders within the collaborative network. Trust is necessary to sustain these relationships.	[129], [143]
Factors influencing stakeholder involvement and co-creation success		
Open culture	Stimulates the system's readiness and preparedness to co-create value. It is the backbone of the system and plays a strategic role in how the system adapts to changes. Open culture means that the system	[143], [141], [145,148]

	should be: (1) open to its environment, (2) promote cooperation in its environment, (3) be open to new knowledge and changes, and (4) ensure free formation of relationships with all relevant stakeholders.	
Open resources	Resources are the basic factors that determine the system's success in the age of complex health system environments. Open resources are important as they encourage the network of resources and the integration of activities.	[141]
Open knowledge	Open knowledge results from the solid foundation of open culture and open resources. Occurs when everyone has free access to knowledge to be able to use it, modify it and share it.	[21], [141]
Healthcare system openness	Refers to the actions within the primary healthcare facility that open the facility up to its environment through transparency, access to knowledge and information, and collaboration. These actions are based on open culture, open resources and open knowledge.	[21], [141],
The ability to reduce the impact of the complexity of the health system environment	The system needs to be able to reduce the impact of the complex environment to increase the certainty of its activities and ability to exploit opportunities emerging in the environment. The complexity of the environment refers to the interdependent and interconnected entities that facilitate the healthcare system and include: stakeholders, technology systems and the facility/organisation structure.	[141], [124]
The strength of the relationship that the healthcare system has with its stakeholders	It is vital for the system to strive to build stronger relationships with its stakeholders to reduce the impact of the complex environment. The goal of strengthening this relationship is to reduce the sensitivity of the system to changes occurring in the environment.	[70], [141]
Stakeholder characteristics	Influence whether or not stakeholders are willing to participate and co-create. Intrinsic factors such as culture, values, level of education and language barriers affect a stakeholder's willingness to participate.	[111], [141]
Social and human capital	Necessary for sustainable involvement of individuals with differing levels of marginalisation and access to health services. Relationships with these individuals are not homogeneous and can differ based on the characteristics and context of the individual.	[165]
Attitude towards stakeholder participation	Attitudes of healthcare officials on stakeholder involvement affects and influences the extent to which co-creation occurs.	[165,172]
Factors influencing information and knowledge sharing		
Infrastructure/Engagement channels	Technical infrastructures and decision support architectures that support various applications for the creation of value and improvement of operational efficiency.	[165]
Interoperability	Interoperability allows for meaningful and reliable use of information within the public healthcare system through the use of information systems which ultimately encourages data quality and consistency. The full potential of interoperability may be realised through the user's (i.e. healthcare workers) adoption and acceptance of information systems.	[173]

Adoption of information systems	Influenced by factors which include: (1) attributes such as the perceived usefulness of the information system compared to its perceived ease of use, complexity and quality; (2) characteristics of the healthcare individuals adopting the innovation; (3) contextual factors such as top management support and social norms; and (4) task characteristics such as difficulty and newness	[145,148]
Silos	Data silos prevent users from obtaining a consistent representation of information and knowledge by restricting information and knowledge sharing. This affects collaboration amongst stakeholders and decision making. Commonly accepted standards and data integration is necessary to bridge data silos and therefore generate data of true value.	[174]
Data management	Collecting, storing, analysing and distributing data using a set of effective and well-designed data procedures and structures. Data management is essential for strategic initiatives such as: (1) improving strategic decision making, (2) facilitating the integration of stakeholders and (3) identifying new value opportunities	[175,176]
Quality of data produced from systems	Driving improvement of data quality is essential to provide better healthcare services. Correct, reliable and up-to-date data is critical and its benefits include: (1) high quality care, (2) ensuring that legal requirements and professional standards are met, and (3) supporting strategic planning and management of health and social services.	[177,178]
Value of information	Information is a carrier of value which increases the more it is used and shared (i.e. value-in-use, value-in-exchange). The value of information increases even more when it is accurate, reliable and up-to-date.	[179]
The output category		
Desired value outcomes		
Compatibility of co-creation variables	Value co-creation is driven by the relationships between participants, the environment and the healthcare facility itself. These variables determine the readiness of the system to co-create value within its ecosystem. These variables need to be compatible to successfully co-creation value.	[129], [141]
Measured value	The value created within the system is a measure of the success of the value creation system and can also serve as an indicator of the success of value co-creation in the system. By measuring the value created in the system, action can be taken for further improvement.	[141]
Sources of value	It is vital to identify and understand the different sources of value that emerge in the ecosystem. These sources of value are necessary in order to understand value logic in an ecosystem and how value is and can be co-created in the ecosystem.	[141]
Quality of knowledge that is used, modified and shared	Using, modifying and sharing quality knowledge accelerates innovation within the ecosystem. Quality knowledge is a necessary outcome of value creation as it allows for disparate elements of knowledge to be identified and used in cohesive ways.	[21]

Stakeholder satisfaction	Stakeholder satisfaction has an influence on the sustainable growth and success of the healthcare system. The healthcare system's relationship with its stakeholders is important to assure the satisfaction all relevant stakeholders.	[21]

7.4 Chapter 7 summary

The evaluated and adapted framework was the main outcome of Chapter 7. This was following the semi-structured interviews that were conducted by the researcher. The interviews were conducted with industry experts from varying disciplines to validate concepts and inform the researcher on concepts overlooked. The data from the interviews was extensively examined and notable findings and insight were used to modify the framework.

Chapter 8: Framework evolution Part 4: Practical case application

8.1 Introduction

Chapter 8 comprises the final step of the evaluation of the framework. The evaluation process in this chapter involved an in-depth industry case study that was completed on a successful digital healthcare organisation, Jembi Health Systems. This non-profit organisation specializes in digital health information systems for low resource settings in several developing countries in Africa, which include South Africa. As previously explained in Chapter 6, this case study differs to the theoretical case study conducted in Chapter 6. The aim of case study conducted in Chapter 6 was assess the adherence of the framework to the standards of an existing value creation initiative. The purpose of this case study is to investigate and understand how a healthcare system functions as an organisation in order to relate this back to the framework. In this chapter, an overview of the case study process that was followed is discussed, followed by an overview of the Jembi Health Systems case. The outcomes from the case study are analysed and discussed and the subsequent recommendations, conclusions and reflections from the case study analysis are presented. The chapter then presents and discusses the procedure and results from the framework being ranked by industry experts to explore the relevance and usefulness of the framework. The outcomes from both the case study and the framework ranking were used to gain insight on the applied world for the purpose of adapting and modifying the framework where needed. This adapted and modified framework forms the final framework and management tool.

Chapter 8 objectives:

- Describe the requirements to select the appropriate case study
- Discuss the procedure followed to conduct the case study
- Describe the ethical considerations for the case study
- Present the case study process for Jembi Health Systems
- Analyse and present the findings from the case study
- Reflect on the application of the management tool on the Jembi Health Systems case
- Present and analyse results from the framework ranking exercise
- Reflect on the usefulness of the tool in the healthcare context in a developing country

8.2 Selecting the appropriate case study

The use of case studies in information system research has gained considerable popularity due to their ability to increase the value of the research findings [180]. Their use is required when needing an explanation or the why' or 'how' of the phenomenon in question [181]. Case studies achieve this through their descriptive power and attention to context which strengthens the precision, validity and stability of the findings [181].

An appropriate case study was used in the study in order to fulfill the last of the project objectives. These objectives required the analysis of a practical case that considers real-world issues to assess the framework's suitability as a management tool for value creation. To achieve this, the case needed to include factors that contribute to healthcare complexities, with a strong focus on the determinants of an ideal health information system and successful value creation system. Furthermore, the case had to have active healthcare improvement initiatives and/or interventions directed at addressing the needs and issues that exist within a healthcare system.

The case used in this chapter meets the above mentioned requirements. What made the case particularly attractive was that the case represents an ideal example of eHealth interventions that

are utilised to strengthen healthcare practices with the goal of providing better care for people that live in low resource settings. Further, the case shows a diversity of opportunities and approaches that may be adopted to improve a population's access to the health care services through clear value demonstration.

8.3 The design of the case study

Although case study methodology has been scrutinised and criticised as a research tool, it is a reliable methodology when it is executed with care. Specific guidelines exist for researchers to follow when carrying out case studies to enable reliability and validity of the investigation. The design of the case study closely follows these guidelines which consist of a four stage process proposed by Tellis [182] . The four stage process includes: designing the case study protocol, conducting the case study, analysing the study evidence and developing conclusions, recommendations and implications based on the evidence. Table 8.1 presents the four stage process along with the sections within which each was conducted.

Table 8.1: Four stage case study process [181]

Case study stage	Description	Section
1. Design the case study protocol	Determine the required skills Develop and review the protocol	Sections 8.3 – 8.5
2. Conduct the case study	Prepare for data collection Conduct interviews	Sections 8.3 – 8.5
3. Analyse the case study evidence	Use analytic strategy	Sections 8.6 and 8.7
4. Develop conclusions, recommendations and implications		Sections 8.7, 8.9 and 8.10

The formulation of this protocol is necessary for the overall progress and reliability of the study. In order to formulate the protocol, it is recommended that it includes four elements. Firstly, the protocol should include an overview of the case study project within the larger project. Secondly, the protocol should include field procedures which serve as reminders about the procedures, data sources and the location of those sources. Thirdly, the researcher should use case study questions to guide the data collection process. Finally, a guide for the case study report should be included. It is proposed that this guide be planned at the start in order to outline and format the report.

The role and aim of the case study within the larger project was discussed by the researcher earlier in the chapter to provide an overview of the case study project. The researcher arranged three distinct components that make up the case study, in a sequence as a reminder of the procedures that needed to be followed together with their respective resources. These components are presented in Figure 8.1. This was then followed by the development of the questions which guided the interviews. Finally, an outline of the format in which the case study would be documented and presented was developed. As, stipulated by the REC, the researcher obtained permission from the institution prior to conducting the case study and further obtained written consent from the interviewee before obtaining data.

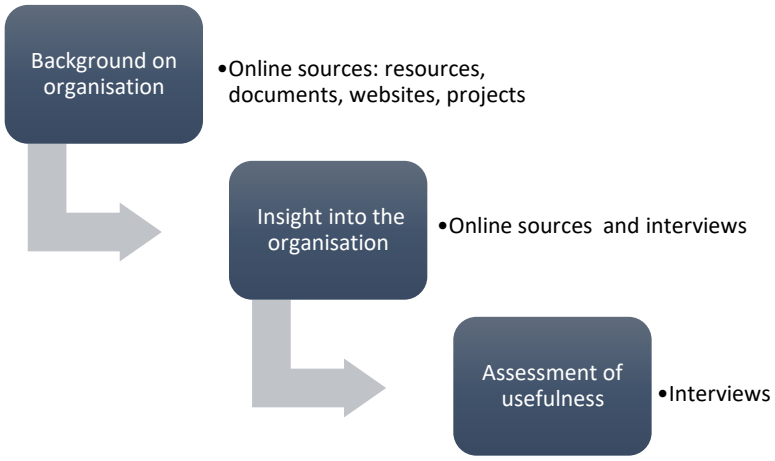


Figure 8.1: Components of the case study procedure

Background information on Jembi Health systems was collected by the researcher using online sources such as documents, websites and publicised projects to acquire information on the organisation. This was then followed by the researcher conducting two rounds of interviews to firstly gain further insight on the organisation and secondly to assess the usefulness of the framework developed by the researcher. The interviews carried out in the case study differed to those conducted in Chapter 7. The aim of interviews conducted in Chapter 7 was to evaluate the concepts constituting the framework and to identify concepts overlooked by the researcher. The purpose of interviews in the case study was to investigate and understand how Jembi Health Systems functions as an organisation in order to relate this back to the framework. Predetermined questions, derived from the framework, were used to conduct the semi-structured interviews in the case study. The interview process was carried out using a similar manner as in Chapter 7 with a slight adaptation of the process outlined by Rabionent [162]. This interview process is presented in Table 8.2.

Table 8.2: Interview process for case study [162]

Stage	Description	Section
1. Select interview type	Select between structured, unstructured and semi-structured	Section 8.3
2. Establish ethical guidelines	Investigate ethical guidelines to consider when conducting interviews	Ethical clearance from REC, refer to Section 1.7 and Section 8.4
3. Craft interview protocol	Grasp a good understanding of the subject matter to develop the questions and probing questions	Sections 8.3 – 8.5
4. Conduct interview	Conduct interview and record interview using notes, audio recording and video recording	Section 8.3
5. Manage and analyse data from interview	Manage and organise data gathered from the interview	Sections 8.5 – 8.7
6. Report findings	Present the findings from the data in a manner that is trustworthy	Sections 8.7, 8.9 and 8.10

The two overarching categories of the questions related to: (1) the dimensions of the ecosystem considered in the framework and (2) the framework development. Care was taken during the development of the questions to ensure that the organisation was investigated and not the interviewee in order to gain a full understanding of how Jembi Health Systems operates in each of

the categories. The data collected from the interview was transcribed, organised and analysed using the predetermined framework categories, which simplified the process. Furthermore, this made the identification of missing/overlooked categories easy to do.

8.4 Approach for gathering and analysing data

The data gathered for the case study relied on the analysis of different sources to inform the three components of the case study presented in Table 8.3. These components include: (1) background information on organisation, (2) insight into the organisation, and (3) assessment of the usefulness of the tool. As discussed in Section 8.3 the different data sources included online sources and interviews with the organisation's employees. The online sources included the company website, online articles and publications, and organisational notes made by the researcher as presented in Table 8.3. The collective analysis of these sources in addition with the first interview round added to the first two components of the case study. An Interview was conducted with an employee from Jembi Health Systems to add to the second and third components of the case study presented in Table 8.3. The interviewee was selected based on their rich experience industry which spans over 29 years, their role at Jembi and their past academic history in the healthcare field. The researcher reached out to two other employees from Jembi, however both were unavailable for interviews.

Table 8.3: The three Case study components and subsequent data sources

Case study component	Data collection method
1. Background on organisation	Jembi Health Systems website, news articles, organisational notes
2. Insight into the organisation	Interview and discussion with a representative from Jembi Health Systems, organisational notes
3. Assessment of usefulness	Interview and discussion with a representative from Jembi Health Systems

The framework dimensions and their respective canvases were used to structure the interview and questions in order to investigate certain aspects of Jembi Health Systems. Subsequently the data gathered from the interview was linked back to the framework during the analysis of the data and was used to determine its usefulness in the context of Jembi Health Systems, which formed the third component of the case study.

The interview protocol, that was tailored to conduct the semi-structured interviews, was used to ensure that the appropriate information was obtained from the participant. During the interview, an overview of the research was presented to the interviewee and the aim of the case study interview was discussed. The framework was then presented and concisely explained to ensure that the participant understood what each of parts of the framework meant. This was followed by questions regarding the framework specifically relating to Jembi Health Systems. Finally, the researcher invited the additional participants to rank the framework for the purpose of informing the researcher on the relevance and importance of activities in the applied world. This further helped to determine the usefulness and appropriateness of the framework as a management tool for value creation in the healthcare ecosystem context. The results from the framework ranking are discussed in Section 8.7.

Following the completion of the case study components, the data collected was synthesised, analysed and related back to the framework. In this case study, the operational and managerial details of the organisation were emphasized as these details could not be obtained during the theoretical case study in Chapter 6. This ensured that a comprehensive overview of Jembi Health Systems and their technology platforms was obtained.

8.5 Overview of Case study: Jembi Health Systems

Jembi Health Systems is a non-profit organisation that provides eHealth and health information system solutions in developing countries mainly in Africa. Jembi's main goal is to provide better care for people living in low resource countries by working with local and international donors and partners to develop sustainable solutions. The organisation applies technical and implementation expertise to design and build people-centered information systems that tackle challenging health problems in low resource settings. Jembi's operational regions in Africa include South Africa, Mozambique, Rwanda and Zimbabwe to name a few.

Jembi's approach involves developing sustainable business models for health information systems via built up networks within Southern and Eastern Africa as they recognise the strength that these networks cultivate. The use of open architecture for health information systems is explored within these networks to determine how it could be applied in low resource settings while still operating and maintaining existing systems. Jembi enables this approach through shared expertise, tools, techniques and best practices.

Jembi has developed several tools across African countries in the healthcare industry. These tools are categorised by Jembi into project categories which include: HIV and TB, interoperability, electronic health records, maternal newborn and child health, immunisation tracking, mobile health, research and innovation, health information exchange, blood safety and haemovigilance, and disease surveillance. Table 8.4 presents each of the project categories with their descriptions and benefits defined.

Table 8.4: Jembi Health System project categories, their descriptions and benefits

Project category	Description	Benefits
HIV and TB	Developed to manage HIV and TB to reduce their social and economic impact.	• Improvement of methods used to collect, manage and analyse data at various health system levels.
Interoperability	Optimise the health of individuals and populations by coordinating devices and applications within and across organisational boundaries.	• The connection and coordination of different information systems; • Exchange and use of data between stakeholders.
Electronic health records	Store and share patient history between healthcare workers to make informed recommendations.	• Efficient storage and exchange of data; • Allows healthcare workers to interact and collaborate with another across different healthcare organisations.
Maternal newborn and child health	Solutions that ensure efficient use of resources in underfunded and undeveloped health systems to reduce the mortality of children, newborns and mothers.	• Provides better access to information for patients, community health workers, and clinicians; • Quality data for policy makers; • Allows for evidence based decision making.
Immunisation tracking	Technologies that collect and track immunisation data.	• Provides caregivers and health workers relevant and important information; • Allows for immunisation data to be efficiently collected and tracked.
Mobile health	The use of mobile devices to support treatments and medical care.	• Educates consumers on preventative healthcare services;

		• Allows for disease surveillance and management.
Research and innovation	To drive innovation and digital health solutions.	• Accelerates innovation and digital health solutions.
Health information exchange	Electronic transmission of healthcare data between healthcare workers, facilities and the government.	• Allows for appropriate and secure access to patient health information; • Improves cost, quality, safety and efficiency of patient care; • Informs the planning and policy development processes.
Blood safety and haemovigilance	Electronic information systems used to improve the standards to blood services.	• Improved quality and safety of blood transfusion practices in Africa; • Safe, accessible and sustainable blood programs.
Disease surveillance	A systematic process used to collect, analyse, interpret and disseminate disease related information.	• Enables reduces morbidity and mortality through public health action.

8.6 Applying the conceptual framework in the case study

In this section, the framework dimensions and the canvases that they are composed of are applied to the Jembi case. This was done using a systematic process in order to gain an in-depth understanding of the organisation for the purpose of relating this back to the framework. It must be acknowledged that the case study did not provide the opportunity for all of the frameworks items to inform the case study due to the interview time constraint and the limitations that came with only one employee being interviewed. The case study does however provide an opportunity to display the suitability and relevance of the framework in the applied world.

8.6.1 Jembi's profile

In connection with dimension one of the framework, the Pre-Use Canvas was used to determine the profile of Jembi Health Systems. The profile considerations are presented in Figure 8.2. Jembi is classified as a digital health organisation as it develops innovative eHealth interventions which include digital technologies which have a significant impact on the healthcare landscape. In terms of the healthcare scope, Jembi provides various projects that could form the healthcare scope under which the value creation system could be used. These projects, as discussed in Section 8.6, are grouped into various categories and are applied mainly in the Southern and Eastern parts of Africa. The stakeholder profile is dependent on the selected healthcare scope as stakeholders who are involved and not involved varies given the scope.

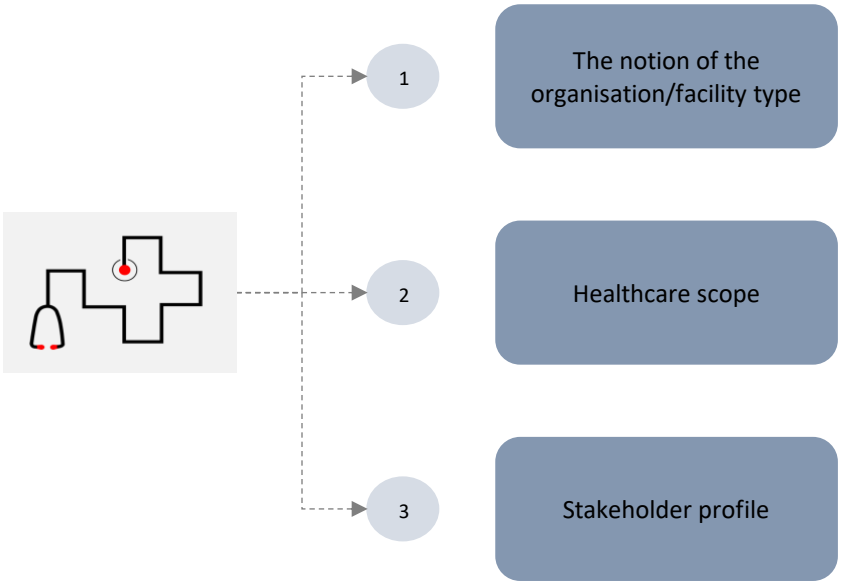


Figure 8.2: Establishing Jembi's healthcare profile

Jembi's '*Journey cross border immunisation tracking tool*' can be used as an example of how the healthcare scope and stakeholder profile could be established for one of Jembi's solutions. The healthcare scope would therefore be on immunisation tracking and the extent of the relevant components that encompass the immunisation solution. The solution is designed to operate fully in offline environments to enable and strengthen care of individuals in rural locations that have little to no electricity. The solution involves the use of a 'Journey card', which is the electronic version of the immunisation record, that patients use to keep them anonymous. Journey enabled facilities are then used to track cross-border movements for immunisation services to ensure that caregivers remain up-to-date with vaccination events. After defining the healthcare scope, the stakeholder profile could be used to determine which stakeholders were involved and which were not. Stakeholders included the department of health, the healthcare workers, patients and the donors. Following the better understanding of Jembi's profile, an investigation into the managerial and operational details of the organisation could begin and be linked back to the framework.

8.6.2 Value creation development parts

Subsequent to the identification of Jembi's healthcare profile, the value creation development parts were investigated. The information obtained from the investigation was done through an interview and online resources, as discussed in Section 8.5. The investigation was guided by Dimension two of the framework which comprises the tool guideline. The tool guideline consists of considerations or requirements of the value creation categories. The tool guideline emphasizes the possible actions that are required or need to be considered within each development stage. Aspects that are key for the development of Jembi's value creation process are discussed in the following sections.

8.6.2.1 Governance

It is clear from the data gathered that Jembi's governance structure is twofold. It firstly embodies a scientific-based governance structure which aims to support the healthcare ecosystem's ability to reach desired goals. The platforms they develop are support platforms that are intended to firstly enable health impact and secondly to make life easier for their stakeholders. Jembi secondly embodies an adaptive collaborative governance structure as it cultivates networks where expertise and skills are shared to develop country level solutions. Jembi relies on these two strategies to respond to the changing needs of their stakeholders in order to design and develop flexible tools that can be used by people with differing levels of skill and knowledge.

8.6.2.2 Co-creation

When it comes to co-creation, Jembi collaborates with organisations, governments and donors to design and develop human-centered and open sourced information systems to improve the health outcomes of those who need it most. While collaboration is a prominent theme in Jembi's strategy, there are cases where the level of co-creation is dependent on the life cycle stage of the intervention. Co-creation is important but who they co-create with and when they co-create is what is crucial for the organisation. For Jembi, it comes down to looking for opportunities for co-creation and the value opportunities that come from co-creation.

8.6.2.3 Information and knowledge sharing

Information and knowledge sharing greatly influences Jembi's value creation success. Jembi believes that robust health systems as well as information knowledge sharing is key to advance global health. Jembi has capacity building activities in place that they use to develop their users, trainers and support staff. These activities involve sharing information and exchanging experiences for the purpose of gaining new knowledge and networking with the digital health and overall information system communities at the national, regional and international levels. The importance of information and knowledge sharing also goes for the technologies that they design and develop. Jembi believes that sharing information and facilitating the sharing of information, through governance and standards, is essential and has the power to benefit communities and improve the care that people receive.

8.6.2.4 External environment

Jembi's external environment focuses on the factors that may implicate the success of the organisation and its interventions. Political, economic and social factors that span the environment of healthcare system don't have a direct effect on the development of technology platforms that the organisation builds however what is affected is (1) the ongoing support for some of their platforms (2) the alignment of their technology platforms with the department of health and (3) the adoption of their platforms. Even though they get contracts to build certain platforms, it's important for them to determine whether it should be built in the first place because value for them lies in the uptake and use of their technology platforms.

8.6.2.5 Healthcare organisation

Jembi acts as an intermediary between the public sector and their donors. This allows the organisation to support and operate within various networks of like-minded organisations to fulfil its mission and vision of advancing sustainability in the healthcare system. On a larger scale, the organisation also facilitates the link between country programs and the wider international open-source communities to further uphold the concept of sustainable development of healthcare solutions. One of Jembi's core values is that investing in people within the organisation and their partners is important for the success of their work. This involves strengthening opportunities for learning and sharing, and fostering learning exchanges which bring people together to discuss and jointly come up with solutions to problems.

The innovative products and services that Jembi develops don't directly correlate to the health impact and value creation. Instead, the value and the impact that these technologies have is largely dependent on the people who adopt and use them. In this sense, these technologies form platforms for value creation and become of value once they have been adopted and used effectively to improve the care that people receive. The products and services developed by Jembi include open architecture, standards, and information systems.

8.6.2.6 Stakeholder

Jembi works with a varying group of stakeholders to design and build interventions that result in the improvement of health outcomes. Jembi's key stakeholder groups include: the department of health, healthcare workers, data managers, facility directors, ICT staff, community health representatives

and patients. It is important that the strategies of the respective stakeholder groups align to ensure that the interventions developed have purpose and are of value. At the center of Jembi's work are the end users. Jembi believes in providing value for their end users by clearly demonstrating the value of the technologies they develop to the people who use them.

8.6.3 The value creation system: understanding the ecosystem design and actors

The ecosystem literature discussed in the research, suggests that organisations such as healthcare organisations are embedded within an ecosystem of interconnected technologies, networks and entities that are organised around the focal organisation [21], [22], [84], [85], [90]. Furthermore, there are value creation systems that exist within these ecosystems that provide the opportunity for value to be created. However, value creation isn't necessarily guaranteed within these ecosystems, as was discussed in Section 4.4.1.2, the emergence of value is largely dependent on how entities behave and pursue opportunities within the ecosystem [112]. This notion holds for Jembi as it is an organisation that interacts with various entities that exist internally and externally to the organisation to develop technologies that provide opportunities for value creation.

Jembi's value creation system is embedded within two ecosystems as shown in Figure 8.3. The value creation system is similar in structure to what has been described in this research and includes (1) inputs, (2) strategic priorities and activities and (3) outputs. Jembi also has ecosystems for each of its projects which have their own ecosystem actors and ecosystem designs and structures that most likely differ for each of their projects.

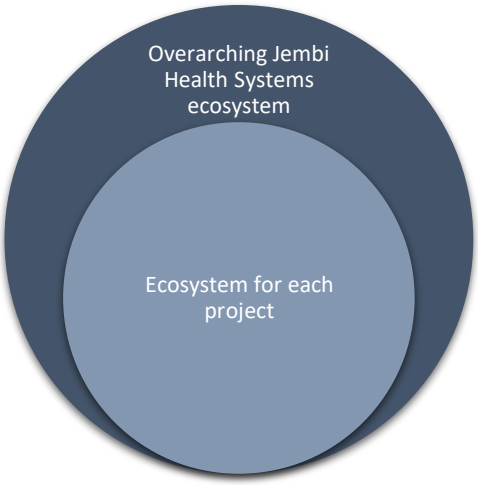


Figure 8.3: Jembi's ecosystems

Jembi's value creation system is investigated from an ecosystem perspective next, as this forms the focus of the framework. The investigation was guided by, but not restricted to, the framework's value creation canvas and its concepts. It should be noted that Jembi's value creation process is not as orthodox as described in literature. This is mainly due to the organisation's structure and ecosystem structure. The investigation includes the analysis of the data gathered from the interviews as well as the data obtained from online resources. The discussion draws from this data and highlights elements that are key to Jembi's value creation success.

8.6.3.1 Input category: the external environment

The input category of the framework as described in the research comprises the external environment. The concepts considered in this category include: funding and support systems, political support and buy-in, corruption, healthcare reform, regulatory standards or guidelines, incentives, healthcare uncertainty, information asymmetries. The input category was applied to the Jembi case study to highlight notable influences that have the greatest impact on the organisation's strategic priorities and activities and furthermore their outputs.

There are certain external influences that are associated with Jembi and its technology platforms. The most prominent influences that were observed were funding and support, political support and buy in, and regulatory standards and guidelines. Jembi is a non-profit organisation which means they primarily work with donors to fund and support their projects. Though Jembi tends to think of themselves as partners of the donors, they actually are not. They essentially are the 'experiment' as donors assess their work to determine whether or not it is effective before investing. Jembi isn't greatly affected financially so long as donors have funds to support them and if there are a lot of donors funding their kind of work. What does have an effect on the organisation however, but doesn't directly affect the development of their technology platforms, is the ongoing support for their platforms. This is with specific regard to support from the National Department of Health. If there is no sustainability within the NDoH to adopt the technology platforms that Jembi develops, then the support for these platforms will eventually come to an end.

Jembi does a lot of work in neighboring countries where it is easier to get political support and governance around what they do compared to in South Africa. Though South Africa is considered "wealthier" than these countries, South Africa still has political positions and individuals with political affiliations in power instead of field positions and individuals with the appropriate qualifications taking up these positions. While this isn't something new and is generally what happens when a revolutionary government takes over management, it hampers some of the decisions that are made by the government. This political-to-expertise imbalance in government presents a challenge for Jembi as it takes the government longer to understand and see the value of the organisation's technology platforms compared to other governments they work with in neighboring countries. This imbalance essentially can lead to information asymmetries between the government and Jembi which can present barriers for co-creation.

There are a number of World Health Organisation (WHO) adopted protocols which standardise the way in which health information is exchanged. These protocols have been adopted in SA and include Fast Healthcare Interoperability standards (FHIR) and Health Level Seven (HL7) standards. In addition, there is a health normative standards framework that is SA specific that has been developed to standardise technology platforms in South Africa. These standards provide clear delineations of what technology platforms should include and henceforth influence the design and development of Jembi's technology platforms. Jembi and the technology platforms they develop have to adhere to and adopt these regulatory standards to align with the NDoH data strategy. It is important for Jembi to adhere to these standards to ensure that the technologies that they develop have purpose, have value and can be adopted and used.

8.6.3.2 The strategic priorities and activities: the bridging healthcare organisation

The strategic priorities and activities category comprises several concepts which include: stakeholder involvement, engagement guidelines, alignment of values and interests, resource availability, sustainable value, change management, sustainable value propositions for stakeholders, information and knowledge sharing, symbiotic relationships and trust. As described in the research these concepts form the properties of a value creating healthcare system. During the investigation of the Jembi case, the researcher identified several concepts that are key for Jembi to successfully create value. These concepts were identified based on the properties of a value creating healthcare system suggested by the framework. The need to consider these properties was also emphasized by the influence of the factors identified in the input category on the organisation's activities.

Jembi's purpose is to design, develop and implement sustainable support platforms that produce reliable information for decision making. Similar to other eHealth organisations, Jembi is grounded in a social entrepreneurship model which guides their development of information technology solutions that can be utilised in the developing world. Jembi's aim is to deliver the right technologies

on time to fit the requirements of the possible solutions. Jembi attributes part of its value to come from the adoption and use of the technology solutions they develop. However, at the core of Jembi's value, which they attribute to their success, is stakeholder involvement. The organisation believes that by fostering and providing learning platforms that bring people together, sustainable solutions to problems can be jointly developed. These two sources of value are the main focus in the case study.

In regard to the adoption of the organisation's technologies, the focus here is on the necessary activities that need to be considered to achieve this. Jembi currently has various running projects that have been implemented across different countries in Africa. The organisation approaches each project as a "business" of its own which necessitates the need to consider each one to have an ecosystem of its own. It is important for the technology platforms that Jembi develops to evolve within these ecosystems. This is to ensure that the technology solutions reach varying developing countries, where resources are often limited. In order for these technologies to successfully evolve, contextual factors such as governance, compliance, values and interests, monitoring and evaluation should be considered.

The researcher acknowledges that these may not be the only factors necessary for technologies to evolve within an ecosystem. However, these factors are based on the data that the researcher was able to gather on the organisation

In the Jembi case, the influence of the NDoH, that buys into the technology platform, and social norms need to be considered. The governance structure of the NDoH is made up of various factors, however the focus in this instance is on treasury and support. Treasury and support is necessary for administrative purposes such as monitoring and facilitating the implementation of the solutions to realise intended goals. The social norms of a given ecosystem also need to be taken into account as they have a great influence on the adoption of the technology solution together with funding and support. The technology solutions need to comply to set standards to ensure that data generated by these technologies is accurate and complete. It is important to note that compliance of a technology doesn't necessarily guarantee its adoption, there is a need for values and interests to align. Jembi needs to support problems tackled by the government by starting the lining to the potential solutions instead of creating separate verticals. This simply means that the work that the organisation does needs to align with the NDoH's plans and strategies to ensure that the technologies developed have purpose and are of value. These technologies also need to continuously be monitored and evaluated. This will essentially encourage value created by these solutions to be fed back into the systems within which they are used to drive system progress.

Co-creation is fundamental to Jembi's successful development of sustainable solutions. Internally, the organisation consists of cross-functional teams that work together to share and combine insight gained from previous applied experiences. These teams work together, within solution constraints, to meet a set of thematic needs. Externally, the organisation partners and engages with varying stakeholders such as national governments and local communities through a collaborative process to determine the needs and requirements of possible solutions. In regard to national governments, it's important for Jembi to take into account the potential political-to-expertise imbalance that may be present in a government and the role it may have on their co-creation activities. Furthermore, acknowledging this influence it is important in order for the organisation to take the necessary steps to ensure that governments understand and see the value of their technology solutions in order to gain their support.

Jembi also works closely with communities to understand their personal and day-to-day experiences. However, while Jembi considers the needs of these communities they don't rely on their understanding alone as they lack industry expertise. In this regard, Jembi believes that having industry experience is much more important to identify gaps and develop solutions. Taking a closer

look at their immunisation tracking project presented in Figure 8.4, the organisation developed a tap and pay card, which is an anonymised card that stores immunisation history and can be read by a normal phone by tapping the card on the phone. This solution does three things: (1) it anonymises the mother which is important; (2) it allows for information to be viewed and accessed offline using the card, which means they don't need connectivity; and (3) it can be read anywhere without compromising the mother's identity. This kind of solution comes from industry experience gained from the security industry, travel industry and mobile connectivity to know how such a solution could work. While there may be times when the level of expertise and industry experience may override the need to develop solutions with a group of people who are not knowledgeable on the challenges in question, co-creating with communities is still important. These communities should not be excluded from the co-creation process completely. Rather, opportunities to co-create with these communities should be identified. Lack of involvement of these communities in the decision making process can greatly affect the adoption and use of the organisation's technologies which will ultimately affect their value.

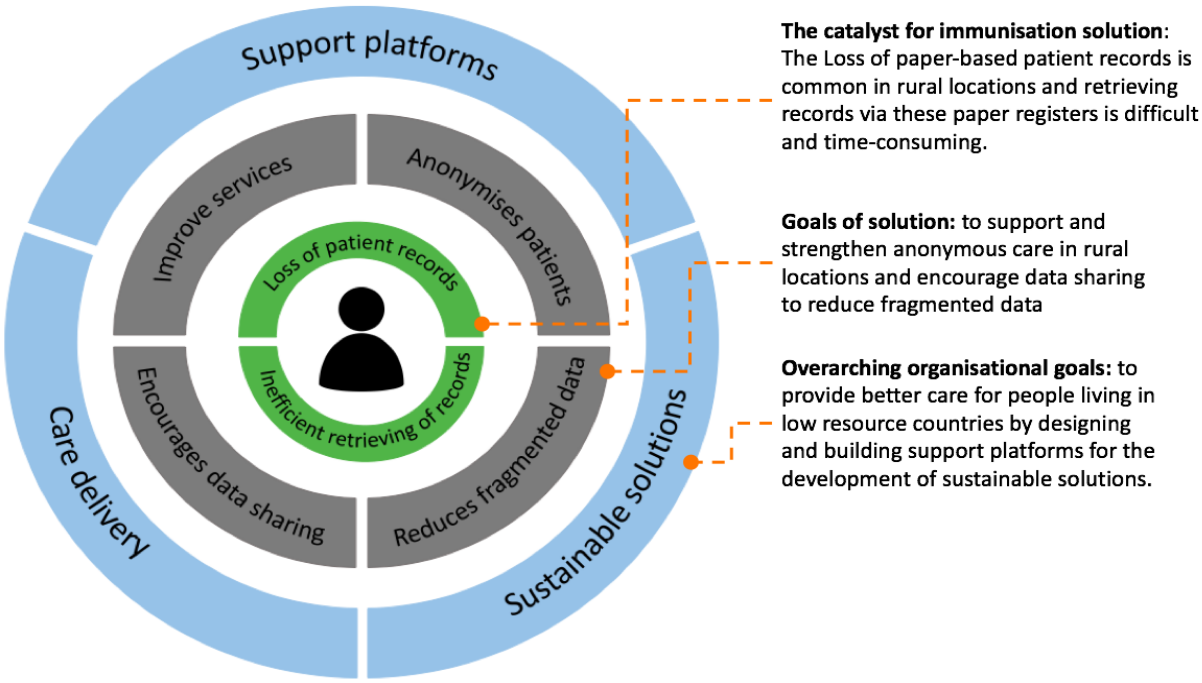


Figure 8.4: Overview of Jembi's immunisation project

The findings from the investigation of Jembi's strategies and activities, together with the co-creation matrix were used to determine the organisation's level of co-creation activity as can be seen in Table 8.5. The organisation's strategies and activities as discussed above suggest that the organisation's level of co-creation is at level 3. This is mainly coming as a result of the organisation firstly having targeted groups which they work with for each given project to develop unique and sustainable solutions. At the core of Jembi's success is the close relationship the organisation has with these targeted stakeholders. Collaborative stakeholder networks are formed within these groups through networked relationships that are facilitated by the organisation. These networks allow for significant sharing of information and knowledge for the development of flexible technology solutions that can reach varying developing countries where conditions differ.

Table 8.5: Determination of Jembi's level of co-creation activity

Component of co-creation	Level 3 co-creation activities	Jembi's adherence	Evidence in Jembi's activities
Healthcare facility openness	Narrow and targeted cooperation of stakeholders	✓	Works with targeted stakeholders for each given project to develop unique and sustainable solutions
	Limited boundaries with significant sharing of information	✓	Significant sharing of information and knowledge gained from previous applied experiences between workers
Ability to reduce the impact of environmental complexity	Adequate flexibility and ability to adapt to changing conditions	✓	Develop flexible technology solutions that can reach varying developing countries where conditions are differ.
	Moderate operational efficiency to translate modern concepts into actualised activities	Could not be assessed due to limited available information regarding the internal functioning of Jembi's operations	
Strength of relationship with full range of stakeholders	Close relationship with targeted stakeholder groups	✓	Close and networked relationship with these targeted stakeholders.
	Good understanding of the needs and expectations of the stakeholders	✓	Closely works with communities to understand their personal and day-to-day experiences in order to determine their needs

8.6.3.3 The output: desired value outcomes

The final framework category, namely the output, focuses on Jembi's desired value outcomes. The concepts included in this category include: compatibility of co-creation variables, measurable value, sources of value, quality of knowledge, and stakeholder satisfaction.

Understanding performance of the organisation and understanding their desired value outcomes is important in order to determine the necessary activities that need to be performed by the organisation going forth to drive progress. Ideally by applying the preceding categories, the performance of the organisation can be determined based on whether their desired value outcomes have been achieved. However, determining Jembi's performance in terms of their technology adoption and usage is difficult without a statistical analysis, which falls beyond the scope of this research. Furthermore, there are instances where these desired value outcomes are not realised which isn't necessarily because the wrong solution was put together or that inadequate research was done. There are just instances where certain nuances just don't work. Therefore, this section discusses considerations that may be taken into account to increase the likelihood of these technologies being adopted and used.

The most important realisation during the investigation of Jembi was that value for the organisation in terms of their technology solutions is both direct and indirect. Direct value for the organisation is created when the technology interventions that they develop actually get adopted by the intended users, as previously discussed. The effective usage of these technologies for healthcare improvement presents the potential for more value to be created once their technology interventions have been adopted. This forms the indirect value that is created. This value is considered to be

indirect as there is no direct correlation between the health impact that these technologies have and the value that they create. This value is particularly difficult to measure as it largely depends on how users use their technologies, which is beyond the control of the organisation.

Jembi considers it to be a priority to provide users with training. They refer to this as capacity development which is essentially the process of training and educating these individuals on how to use their technologies interventions to ensure that they achieve the intended goals. While this is important, it is also important to ensure that their technologies are flexible and adaptable. As previously mentioned, Jembi's technologies form part of different projects which exist within their own ecosystems. Therefore, there is value in ensuring that the architectures that make up these technologies are flexible, adaptable. This is essential in order to allow users to apply their skill sets and level of knowledge when using these technologies to do their jobs.

8.6.3.4 Considering the Aim of the ecosystem canvas

The VC Aim, included in the framework, focuses on ensuring (1) optimal flow of quality knowledge and resources; (2) conformation to values, rules and norms shared within the ecosystem; (3) quality interactions and relationships between stakeholders; and (4) flexibility and adaptability of the system.

The VC Aim serves as an indicator which is intended to track the success of Jembi's value creation activities by ensuring that the organisation adheres to these aims. By adhering to these aims, the organisation will be able to optimise its performance, through the integration of its activities, networks, technologies and entities, which will result in more value being created in relation to the resources it expends. This notion is supported by [21], [143], [141], [158] to list a few as well as interview data from Section 7.2.5.2. To determine whether or not Jembi adheres to these aims, and the degree to which they adhere to these aims requires a critical and possibility statistical analysis of Jembi's activities which is beyond the scope of this research.

A summary showing the findings and recommendations discussed in Section 8.6.3 and its subsections is presented following Section 8.6.4, Figure 8.5.

8.6.4 Feedback on recommendations and conclusions drawn from the case study

As discussed in Section 1.1.2 and Section 4.4.1.1, defining value is an essential prerequisite that is needed to gain an in-depth understanding of an organisation's performance and henceforth drive continuous improvement. The main focus for this discussion has to do with the value created by the technologies Jembi develops as this is one of the ways in which they define their value. As it was discussed in Section 8.7.3.3, the value created from these technologies is two-fold. Value is firstly created when the technology is adopted and secondly when it is used effectively to achieve the intended goals. In regard to the first case, there are many reasons that can result in an organisation's technologies not being adopted. For Jembi, the most notable reasons are due to external factors such as politics and lack of alignment between donors and the NDoH that the organisation has no control over. Understanding these influences and how to work within their bounds was recognised as important during the discussion between the researcher and the organisation's representative. In the second case, the researcher was informed on how the organisation has no control over how users utilise the organisation's technologies. The organisation's representative that the researcher spoke to did however find the recommendation to address this issue through the implementation of standards useful. The representative also added that while standards are important it is important to ensure that these standards don't make it harder for users as this can ultimately lead to their technologies not being adopted. The reason behind this is, if people need to work around standards that have been implemented that means that the standards in place are wrong in the first place. The representative explained, "*when standards are broken the important thing is not to go back and enforce these standards but rather to look at why they were broken in the first place. Finding out what they are doing to get past these standards and adopt what they are using as their standards is*

important". Therefore, monitoring how healthcare workers do their job could be an alternative approach that could be used instead of monitoring whether or not they comply with a certain set of process standards. The implications of such an approach however need to be determined as the lives of individuals are at stake in a healthcare environment.

The organisation's representative appreciated the acknowledgement of the need to monitor and evaluate systems and processes with the intent to improve them. This recommendation is based on the framework's structure which encourages and supports continuous growth and improvement within a healthcare system. The framework has interdependent components that are uniquely organised into a feedback loop to drive efficient system progress. This idea is welcomed as it allows for value created by a system or process to be fed back into the system or process.

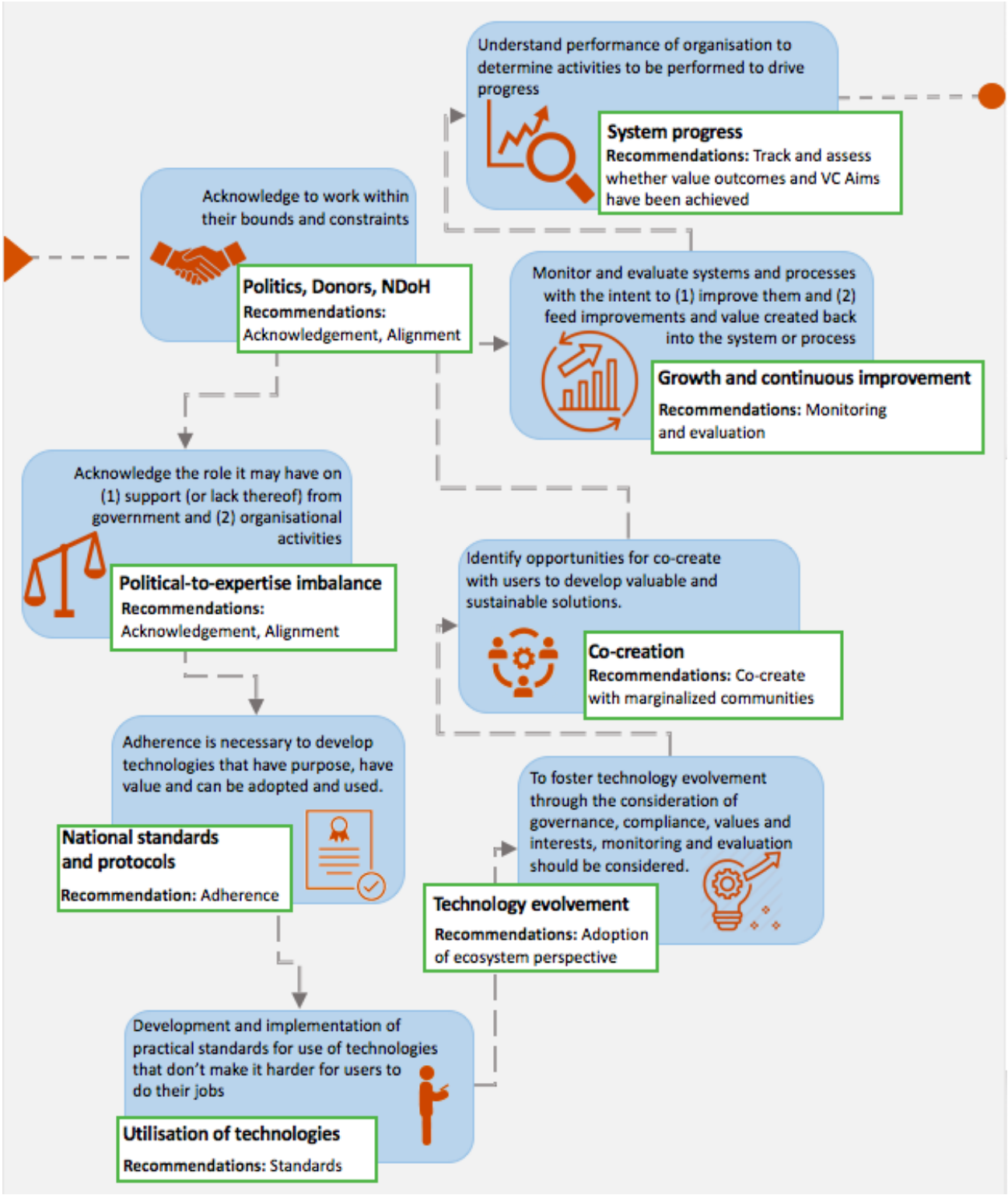


Figure 8.5: Linkage of recommendations

8.6.5 Reflection on the Jembi Health Systems case study

Subsequent to the successful application of the framework to the Jembi Health Systems case, the researcher had a comprehensive understanding of the organisation and its business approach. Jembi lies at the center of its ecosystem and is reflective of a bridging organisation that facilitates the networked relationships between its stakeholders. An important characteristic of the bridging organisation is that it provides a 'platform' for value creation where stakeholders interact to jointly seek opportunities that can address challenges for the purpose of reaching a shared objective. Jembi achieves this by driving stakeholder networks to become learning networks that support continuous value co-creation for the purpose of improving practices and further developing their institution. From the case interviews it was revealed that participation of beneficiaries in the planning and decision-making stages is regarded as appropriate by the organisation at certain points of the development of their solutions. This view differs from what the framework suggests and therefore needs to be considered as an additional layer of the co-creation concept to increase its success.

The organisation's immunisation tracking project is one of the many projects that the organisation runs. The project is treated as a business of its own with its own ecosystem and ecosystem actors. The output of the project is an intervention that is intended to enable a health impact. Based on the case interview, the value created by this intervention requires a mind shift and consideration of the need to co-create with communities. These communities should not be excluded from the co-creation process. Opportunities to co-create with these communities should be identified. This is important as the lack of involvement of these communities in the decision making process can greatly affect the adoption and use of the intervention which will ultimately affect its intended value.

8.7 Framework ranking

The framework was ranked as part of the evaluation process in an attempt to show the relevance and usefulness of the framework. The process involved selecting respondents, who would rank the framework, using predetermined criteria outlined in Figure 8.6. Additional informants were also identified through snowball sampling where respondents identified other people who they considered to be relevant to the study. The researcher reached out to 12 potential candidates of which 3 were identified through snowball sampling. A total of 7, candidates however were willing to participate in the evaluation process. The respondents were grouped into two main groups. Five of the respondents were those who work in organisations that deliver digital healthcare solutions. The remaining two were established researchers who have a vast background in healthcare research and who also have had a hand in developing the National Health Normative Standards Framework.

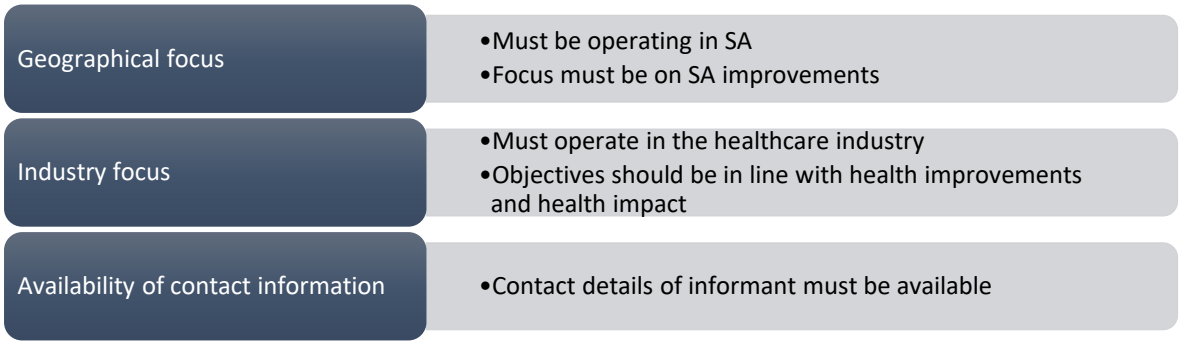


Figure 8.6: Criteria for respondent selection

Digital health interventions were the main focus of the investigation due to their consensus with the value creation approach established in the research. Digital health interventions are conceptualised as scalable tools that aim to improve health and healthcare delivery by improving efficiency, accessibility, safety, effectiveness and personalisation [183]. These interventions are enabled by technologies such as smartphones and websites to realise these improvements [183]. The

investigation of the digital health interventions was supported by their geographical focus, their purpose, and the type of stakeholders involved in their design, development and implementation. Participating candidates were each asked to provide this information prior to the commencement of the framework ranking.

The proposed framework was presented and ranked using a Microsoft Excel format which was distributed electronically to adhere with the COVID-19 regulations. The focus of the ranking instrument was the concepts comprising the framework, which therefore validated its construction. Similar to the semi-structured methodologies followed in the research, the researcher provided candidates with a brief overview on the research and purpose of the framework. This was then followed by candidates being requested to define the elements of digital intervention that they would use as a reference to complete the ranking sheet. This included: the name of the intervention; the geographical focus of its implementation; the purpose of the intervention; and the types of stakeholders involved in the design, development and implementation of the intervention. Candidates then went on to complete the framework ranking sheet which is included in Appendix C. Candidates were asked to rank the concepts comprising the framework according to their consideration, impact, as well as associated effort required to address them. Figure 8.7 presents a breakdown of each of this ranking criteria.

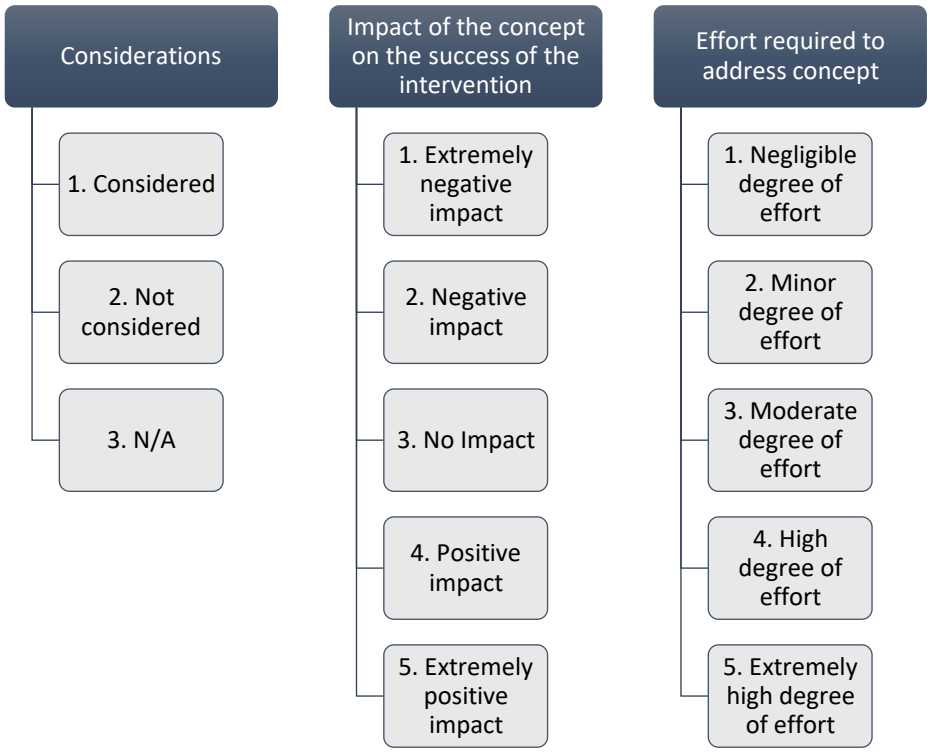


Figure 8.7: Ranking criteria

Participants were firstly required to indicate whether each concept is considered, not considered or not applicable based on its usage within their selected digital health intervention. Participants then had to indicate the impact of each concept on the success of the intervention. Here, five mutually exclusive options were provided for them to select from. This was then followed by participants ranking the effort required to address each concept. This formed the final part of the framework ranking process which once again used a set of mutually exclusive options for the participants to select from. The results from the framework ranking exercise yielded insight into the perceived importance of the frameworks concepts in the applied world. Therefore, the correlation between the impact of a concept on the success of an intervention and the effort required to address the concept

highlighted concepts that needed to be prioritized over others in a value creation system. The results from the exercise and their implications are discussed in detail in the section below.

8.7.1 Framework ranking results

A qualitative trend analysis conducted on the data collected from the ranking exercise is presented in this section. The feedback obtained from the participants regarding the consideration of the framework's concepts in the applied world were populated and are presented in Figure 8.8, Figure 8.9 and Figure 8.10. From the graphs, it can be seen that 23 concepts are partially considered with 15 of the concepts fully considered by the participants. Of the concepts that were practically considered, incentives ranked the highest overall which means that incentives are the least considered concept when it comes to the design, development and implementation of digital interventions. This is followed by silos, symbiotic relationships, sources of value and compatibility of co-creation variables. It was deduced from the notes provided by the participants and further enquiry that lack of knowledge, limited resources and the nature of some of the concepts in given instances contributes to why some concepts are often not considered during the design, development and implementation of digital interventions.

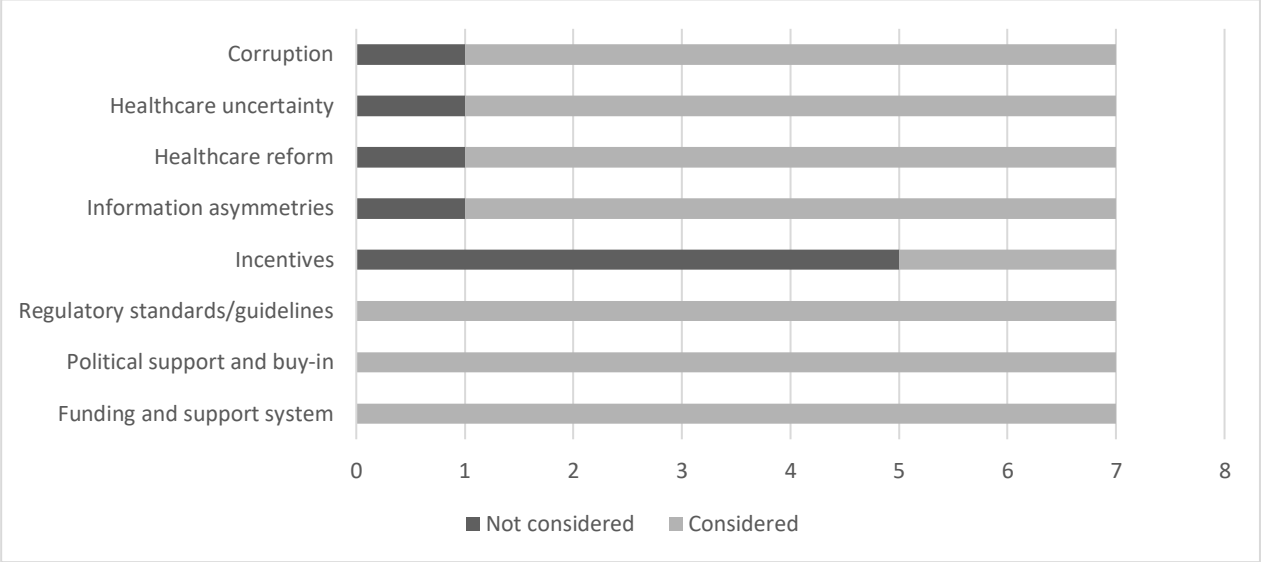


Figure 8.8: Consideration of external influencing concepts

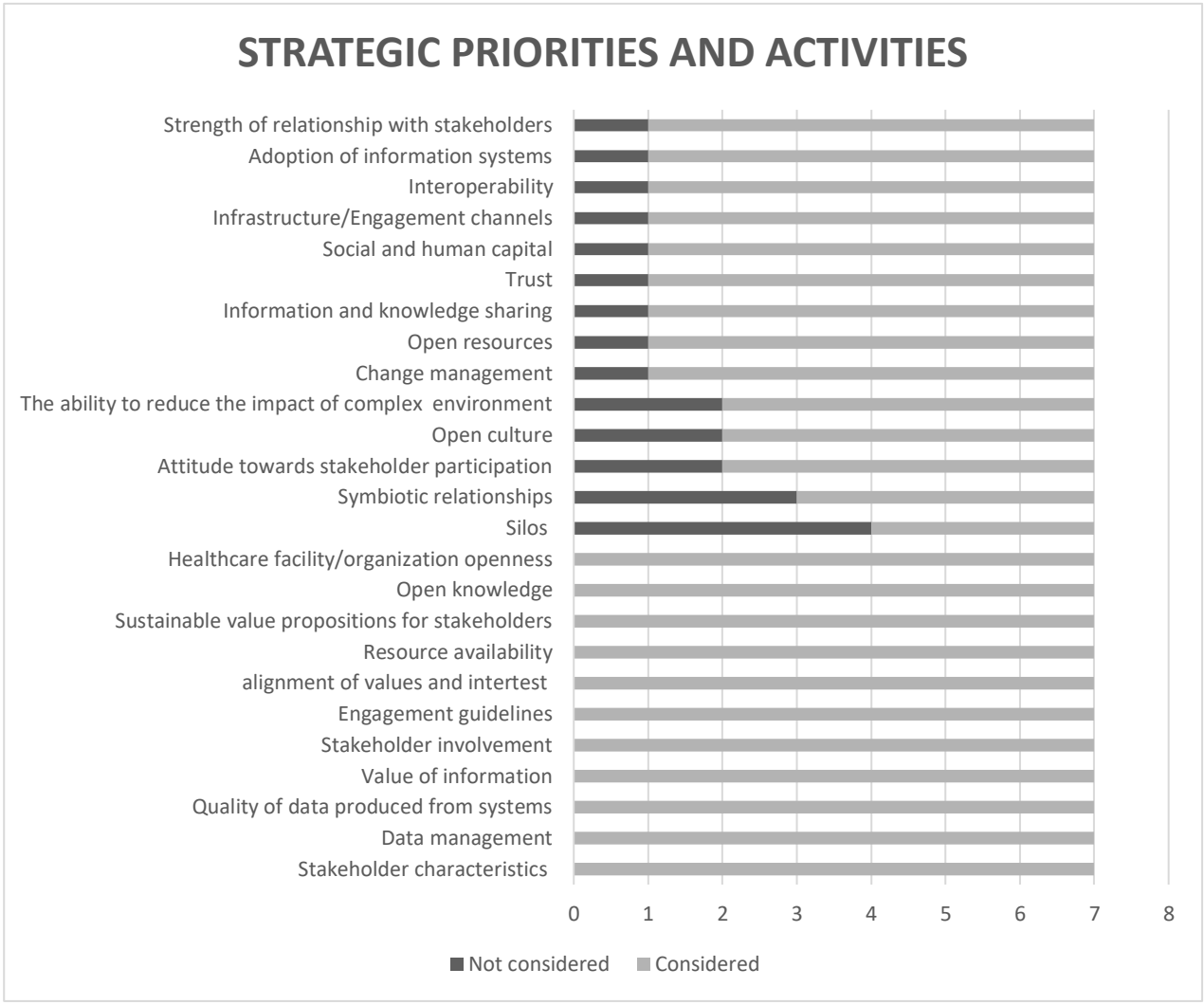


Figure 8.9: Consideration of concepts used to strategically prioritize and conduct activities

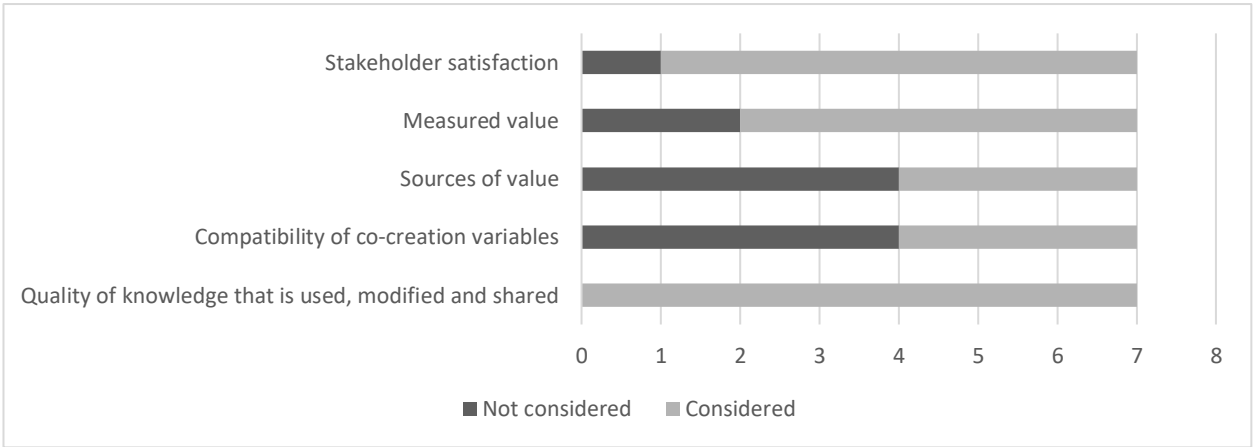
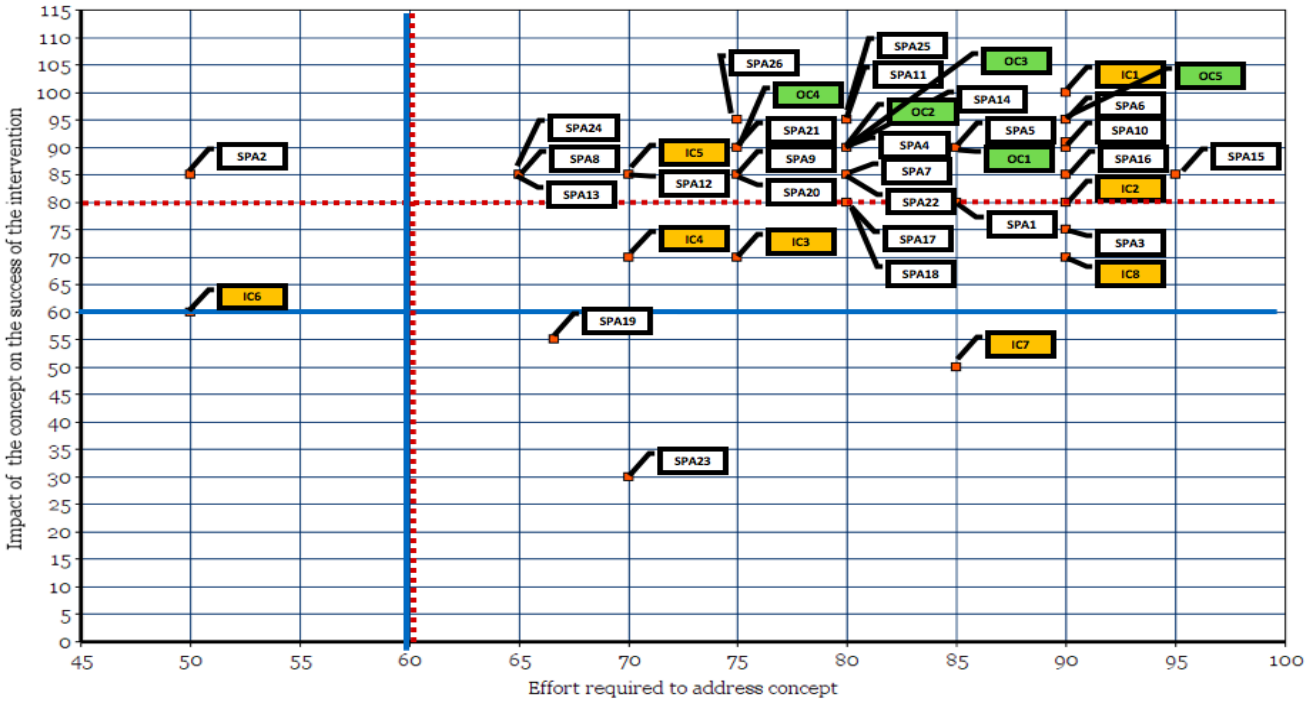


Figure 8.10: Consideration of concepts that address desired value outcomes

The primary motivation behind the framework ranking exercise was for the researcher to identify the impact and effort required to address the framework's concepts from a collective group of industry experts. In Figure 8.11, presented at the end of this section, the impact of the respective concept on the success of a digital intervention is mapped against the effort required to address the concept in

order to compare the two against one another. The graph compares the cumulative frequency at which the respective degree of impact and effort was selected by the participants for each concept. This data was subsequently used to identify concepts that need to be prioritised over others. This was done through identifying concepts that were deemed to have a positive or an extremely positive impact but that require a moderate, high or extremely high degree of effort to address or implement.



IC: Input category		SPA: Strategic priotiries and activities						OC: Output category	
IC1	Funding and support system	SPA1	Stakeholder involvement	SPA10	Trust	SPA19	Attitude towards stakeholder participation	OC1	Compatibility of co-creation variables
IC2	Political support and buy-in	SPA2	Engagement guidelines	SPA11	Open culture	SPA20	Infrastructure/Engagement channels	OC2	Measured value
IC3	Corruption	SPA3	Alignment of values and interests	SPA12	Open resources	SPA21	Interoperability	OC3	Sources of value
IC4	Healthcare reform	SPA4	Resource availability	SPA13	Open knowledge	SPA22	Adoption of information systems	OC4	Quality of knowledge that is used, modified and shared
IC5	Regulatory standards/guidelines	SPA5	Sustainable value	SPA14	Healthcare facility/organisation openness	SPA23	Silos	OC5	Stakeholder satisfaction
IC6	Incentives	SPA6	Change management	SPA15	The ability to reduce the impact of the complexity of the health system environment	SPA24	Data management		
IC7	Healthcare uncertainty	SPA7	Sustainable value propositions for stakeholders	SPA16	The strength of the relationship that the facility/organisation has with its stakeholders	SPA25	Quality of data produced from systems		
		SPA9	Symbiotic relationships	SPA18	Social and human capital				

Figure 8.11: Comparison of the respective degrees of impact and effort for each concept

The ratings used in the framework ranking were converted into percentages as displayed in Figure 8.11. Therefore, in this instance a ranking of 5 used to depict an extremely high impact or an extremely high degree of effort in the framework ranking exercise is presented as 100% for each in the graph. In the figure, the two intersecting blue lines represent the point at which concepts are said to have no impact or require a moderate degree of effort. As can be seen in the graph, the majority of the concepts lie above and to the right of these blue lines. This is indicative of concepts that have a positive or extremely positive impact but require a high or extremely high degree of effort. The remaining concepts that lie outside of this boundary either lie above and to the left of the blue lines or to the right and below the blue lines. In regard to the first case, the location of these concepts on

the graph means that they either have no impact or have a positive impact and require moderate effort to address or implement. In the second instance, concepts are regarded as having a negative impact or an extremely negative impact and require a high or extremely high degree of effort. Each concept is coded using a label and a color that represents the framework category under which it falls. IC indicates the input category and is represented by the yellow blocks in the graph; SPA indicates strategic priorities and activities and is shown in white; and OC indicates the output category and is presented in green. A table is provided in Appendix D showing each of these labels and the respective concept that they align with.

In Figure 8.11, concepts that have a positive or an extremely positive impact with a moderate, high or extremely high degree of effort require the need to be prioritised in a value creation system. This "cut off" is indicated by the red dotted lines. This therefore includes all concepts falling above and to the right of these lines, as well as those concepts falling on the red dotted lines. Four concepts, labelled IC3, IC4, IC8 and SPA3 fall slightly below the red dotted line but still above the blue line. This means that these concepts have a moderate to positive impact with a high to an extremely high degree of effort needed to address or implement. These four concepts also present the need to be prioritised due to their positions on the graph. This decision is further supported by Figure 8.8 and Figure 8.9 as these concepts are ranked as considered in the applied world by majority of the participants. The final concept that needs to be prioritised is SPA2 as this concept is deemed to have a positive impact with a minor degree of effort needed to address it. The selection of this concept is also supported by Figure 8.9 which shows the concept ranked as considered by all industry experts .

The ranking exercise also helped the researcher to identify concepts that were deemed to have no impact, a negative impact or an extremely negative impact but require a moderate high or extremely high degree of effort. These concepts include IC6, IC7, SPA19 and SPA23 and are presented in Table 8.6. The discussion of this outcome together with the investigation into the prioritisation of IC6, IC7, and SPA19 is beyond the scope of the research study. In regard to SPA3, however, the interview data discussed in Section 7.2.5 suggests that data silos significantly contribute to interoperability challenges. Therefore, achieving interoperability cannot happen without the prioritisation of silos. This notion is also confirmed by R Reda, F Piccinini and A Carbanaro [174].

Table 8.6: Concepts identified as less important

Label	Framework concept
IC6	Incentives
IC7	Healthcare uncertainty
SPA19	Attitude towards stakeholder participation
SPA23	Silos

8.7.2 Usefulness of the framework

The framework ranking exercise helps to confirm the relevance and usefulness of the framework. Though the effort required to address or implement the frameworks concepts are high, the impact that they potentially have on the success of digital interventions show to be positive and in some instances extremely positive. The researcher is aware that the results from this evaluation are by no means definitive and additional industry experts may need to rank the framework to increase the confidence of the data obtained from the framework ranking exercise. At the very least the framework provides decision makers with strategic features to consider to assist them in creating value from the digital technologies that they use.

8.8 Modifications to the framework

The case study and the framework ranking activity both provided an opportunity to verify and further refine the framework and its content. There were no significant modifications made to the framework

besides the prioritisation of certain concepts over others as discussed in Section 8.7.1. Changes in the vocabulary of some of the frameworks items were made to improve their clarity. This also included an additional layer of things that are required or need to be considered for these items that were added. This came as a result of the critical discussion that the researcher had with Jembi's representative. The discussion highlighted one area of the framework in which a certain aspect was overlooked. This area was the co-creation aspect which forms part of the strategic priorities and activities category. Though the framework accounts for the fact that the presence and influence of such a concept is crucial in a value creation system it does not account for the practicality of its application in the real world.

From assessing Jembi using the co-creation matrix during the case study, the researcher came to realise that certain levels of co-creation work for different healthcare systems. This means that a healthcare organisation or healthcare facility doesn't necessarily have to be at a co-creation level of level 4 to successfully create value. At the same time however, certain stakeholder groups should not be excluded from the co-creation process as a result of their social capital. Identifying opportunities to co-create with certain stakeholder groups at certain points in their design, development and implementation processes is necessary. In regards to the framework, this meant that the way in which the co-creation matrix was designed to be used had to change. The co-creation levels now are no longer a measure of the readiness of a healthcare organisation's ability to use the co-creation concept but instead is used to define an organisation's level of co-creation. In this instance healthcare organisations have the option to not progress to the next level to successfully create value should their current activities work for them. However, should they find the need to want to progress, the matrix is available to guide them to do so.

8.9 Reflecting on the framework and its use in developing countries

The framework was initially formulated through an investigation of multiple literature sources that included literature that was predominately from first world countries. This was mainly due to most of the literature that focused on value creation, information systems and ecosystems not having a geographical focus beyond first world countries. The researcher acknowledges the influence that this had on the design and development of the framework. However, through conducting the case study and the framework ranking activity the transferability of the research and its output is illustrated despite it being developed from multiple sources that span across multiple disciplines and varying developed countries. The development of this framework therefore provides a contribution to research in developing countries such as South Africa as it provides insight on how a value creation system can be utilised in such instances. The credibility of the framework as a tool for creating value in the context of digital health technologies was also verified through this additional insight. The researcher also acknowledges the need to apply the framework to more cases to further refine its structure and content.

8.10 Chapter 8 summary

Chapter 8 concluded the final step of the evaluation of the framework. The framework and its dimensions were applied into a practical case to verify the suitability of the framework as a tool that can be used to create value in the healthcare context. Results from a framework ranking exercise, conducted by industry experts, was then presented to further verify the relevance and usefulness of the framework. Both the case study and framework ranking exercise provided an opportunity to confirm the transferability of the framework and its usefulness in developing countries such as South Africa. Furthermore, these two activities presented several valuable observations which led to the modification and refinement of the certain framework items. The enhanced framework and management tool is discussed in the next chapter.

Chapter 9: The evaluated framework and management tool

9.1 Introduction

Chapter 9 consolidates the evaluated framework and management tool. The tool was developed to meet the project objectives set in Chapter 1. The chapter begins by discussing the motivation and purpose for developing the framework. This is followed by a summary of the research methodology that was used to formulate the framework. The final management tool is thoroughly discussed with an explanation of the logic of each overarching dimension. Specific attention is given towards how the tool is related to the South African healthcare context, as well the important considerations for the tools use in practice. The final framework and management tool is provided at the end of the chapter.

Chapter 9 objectives:

- Provide a brief discussion for the motivation and purpose for the framework development
- Briefly discuss the methodology followed to develop the framework
- Present the final management tool
- Discuss how the framework relates to the South African healthcare context
- Highlight important considerations for the tools used in practice

9.2 Motivation and purpose for proposed framework

An important motivation for the development of this tool stems from two components. The first source of motivation is rooted in the need to address challenges in healthcare that affect the ability of information systems to create value. The second motivation stems from the need to make the theory of value creation from an ecosystem perspective more relevant in healthcare, especially in the South African context. The framework, inspired by the Sustainable Development Goals 3 and 9, aims to facilitate the creation of value in healthcare facilities to potentially increase the health and well-being of the population.

In a country that has faced numerous challenges rooted in policies that existed during the colonial and apartheid period, changes in South Africa since 1994 have for the most part been progressive [5,146]. There are many challenges however that still persist, specifically in the provision of health services [146]. These challenges include, but are not limited to, access to healthcare, the prevalence of HIV and TB related deaths, the increase in noncommunicable diseases, and increase in infant mortality [5,8,146]. The persistence of these challenges presents the need to develop health-related solutions. Information systems such as electronic health records, mobile phones and hand-held computers are said to play an increasingly important role in the delivery of healthcare services by providing an opportunity to reinforce the health system [18,184]. Despite the benefits of information systems, the utility and effectiveness of information systems to create value in healthcare remains a strategic challenge [154]. As a result, the researcher aimed to explore various value creation practices to develop a framework that can be used to generate value through the use of information systems.

The various value creation practices that were investigated by the researcher provided an anchor for the more abstract concepts of the value creation phenomena to strengthen their explanatory power in the healthcare context. The research therefore recognises the need to understand the constituent parts that make up the phenomena in order to understand it from a holistic perspective. This forms the second motivational factor for the development of the framework. The nature of the framework provides a pathway for growth by offering an ecosystem perspective of the healthcare system. It achieves this by considering the relationships and mechanisms that shape it as well as and the roles, strategies and of the individual actors that form part of the healthcare system.

9.3 Summary of framework development process: methodology and evolution of framework

The management tool was developed by following the CFA approach proposed by Jabareen [27]. The approach, as discussed in Chapter 2, follows a grounded theory technique that aims to identify and trace a phenomenon's key concepts [27]. The approach consists of eight phases which were used to guide the researcher during the development of the framework. The phases were implemented in a manner that allowed the researcher to constantly compare the phases for the purpose of deriving concepts from literature, refining and organising concepts until the final framework was compiled. Various data collection methods were employed to develop the final management tool. These methods were comprehensive in the way they were carried out in the research to reinforce their validity and reliability. The methods used to collect and analyse data in the research included the scoping review, semi-structured interviews with industry experts, case studies and a framework ranking exercise. The process followed to develop the framework is presented in Figure 9.1.

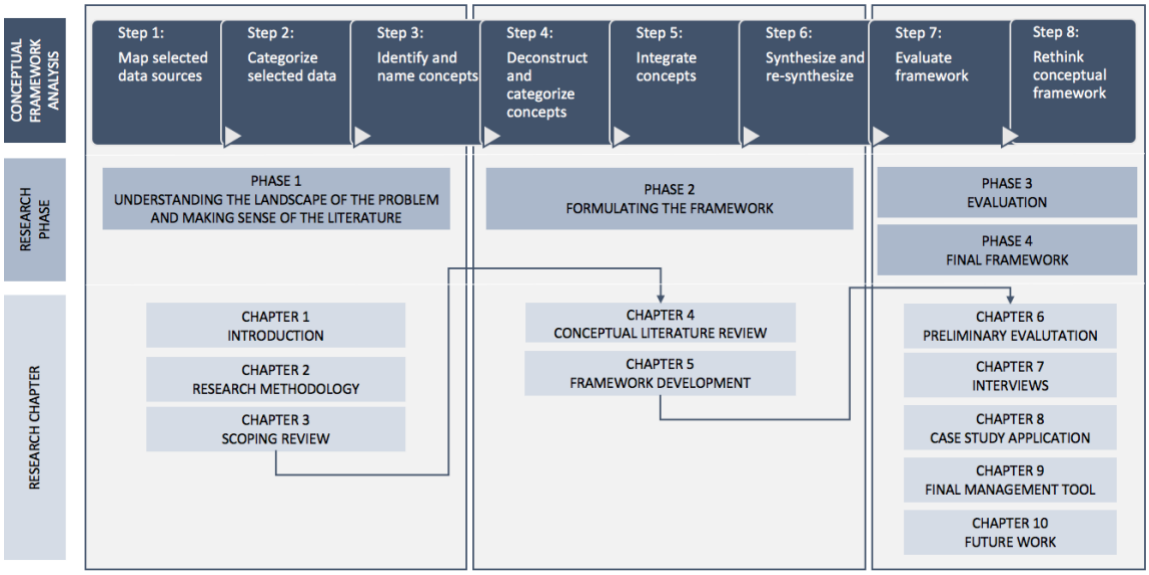


Figure 9.1: Reflection on the development of the framework

The framework development process firstly began by providing background information regarding the project. This, together with defining the problem, and developing the research aims and objectives guided the trajectory of the research and therefore the data collection and analysis processes. The scoping review, which as previously stated was a data collection and analysis method used in the research, sought to guide the development of the framework. Relevant literature was analysed during this review to identify key concepts relating to value creation, information systems and ecosystems for the purpose of highlighting their definitions, characteristics and the multidisciplinary nature of the concepts. These key concepts were compiled into a preliminary conceptual framework.

Subsequent to the scoping review and the development of the preliminary conceptual framework, the evaluation process began. The evaluation process included the use of semi-structured interviews, case studies and a framework ranking activity to complete. Firstly, a theoretical framework was used to provide an initial evaluation of the preliminary conceptual framework. Here, the framework was related to an existing value creation initiative developed within the South African healthcare context to modify and adapt the framework accordingly. Semi-structured interviews were then conducted as part of the evaluation process following the theoretical case study. The aim of conducting the semi-structured interviews was to validate the categories and concepts of the framework and to gain additional insight. The outcomes from conducting the interviews resulted in

additional adaptations and modifications made to the framework. The framework was finally evaluated through the use of an industry based case study conducted on a successful digital healthcare organisation. This, together with a framework ranking exercise formed the final part of the evaluation process. Both the industry based case study and the framework ranking exercise were used to validate the appropriateness of the framework as a tool that can be used to create value in the healthcare context. The outcomes from the case study and ranking exercise resulted in an adapted and modified framework which formed the final framework and management tool.

9.4 Evaluating the proposed management tool against predetermined requirements

In Section 5.3, the researcher deduced requirements from literature that the envisioned framework needed to meet in order to realise the goals and objectives of the research study. These requirements were used in this section to investigate and evaluate the tool's adherence. The requirements were used to evaluate the pre-use canvas, the tool guideline, the ecosystem canvas and the tool structure. The results from the evaluation are presented in Table 9.1.

Table 9.1: Evaluation of framework adherence to predetermined requirements

Framework requirements	Code	Description and reference in research study	Applicable elements of the management tool			
			Pre-use canvas	Tool guideline	Ecosystem canvas	Tool structure
Functional requirements	**FR1**	The framework should encourage sustainable healthcare development *(Section 1.1) and encourage* system longevity and propensity for growth *(Section 4.2)*			✓	✓
	FR2	The framework should identify how collaborative environments can be formed within a healthcare system *(section 1.1)*		✓	✓	
	FR3	The framework should drive continuous improvement *(Section 1.1, 3.6, 4.4)*			✓	✓
	FR4	The framework should support the economic development and human well-being *(Section 1.3)*		✓	✓	
	FR5	The framework should provide fundamental value creation activities needed within a healthcare system *(Section 1.4)*	✓	✓	✓	
	FR6	The framework should highlight the role of information systems in value creation within the ecosystem *(Section 1.4)*		✓	✓	
	FR7	The framework should encourage the evolution of healthcare systems through interactions, cooperation and collaboration *(section 3.5)*		✓	✓	
	FR8	The framework should acknowledge the different governance modes that influence how the ecosystem functions *(Section 4.4)*		✓	✓	

	FR9	The framework should encourage transparency through free and unrestricted sharing of up-to-date and useful information and knowledge *(Section 4.3, 4.5)*		✓	✓	
	FR10	The framework should provide an understanding of how stakeholder groups can effectively support knowledge co-creation by including components either hinder or provide opportunities for collaborative stakeholder networks *(Section 4.5)*	✓	✓	✓	
	FR11	The framework should show how traditional components of co-creation can be utilised in complex and ever-changing environments *(Section 4.5)*		✓	✓	
Structural requirements	**SR1**	The framework should address the theoretical underpinnings of the dynamic ecosystem construct and its actors *(Section 1.4)*	✓	✓	✓	✓
	SR2	The framework should adopt a holistic system-perspective to conceptualise the ecosystem construct by considering the three health system levels which include: the political and economic environment of the health system, the healthcare facility and the primary stakeholders *(section 3.5, 4.4)*	✓	✓	✓	✓
	SR3	The framework should encourage active integration and collaboration of stakeholders with varying needs and capabilities to increase value *(section 3.6)*	✓	✓	✓	
	SR4	The framework should address the network of explicit and implicit relationships that span both the internal and external environment *(Section 4.4)*	✓	✓	✓	✓
	SR5	The framework should acknowledge the role of the healthcare system as an intermediary between diverse stakeholder groups and networks *(Section 4.5)*			✓	
Boundary requirements	**BR1**	The framework should reflect the boundaries within which value is created in a healthcare system enabled by information systems *(Section 1.3)*	✓	✓	✓	
	BR2	The framework should assist ecosystem actors, who share the same institutional logic, with a set of common rules and norms to govern their behavior in the ecosystem *(Section 4.4)*	✓	✓	✓	✓
	BR3	The framework should support value co-creation through networked relationships *(Section 4.5)*	✓	✓	✓	
User requirements	**UR1**	The framework should assist users with tools to address complex challenges affecting value creation *(Section 1.4)*	✓	✓	✓	✓

	UR2	The framework should assist users to understand how value can emerge through the use of information systems by providing them with favorable actions for value creation *(Section 3.5)*	✓	✓	✓	✓
	UR3	The framework must assist users in understanding the dynamics occurring in the ecosystem and the implications thereof *(Section 4.2, 4.4)*		✓	✓	

The framework and management tool adheres to all of the requirements in Table 9.1. Therefore, it can be concluded that the tool meets the key components and themes of the research study's goals and objectives defined in Section 1.3 and Section 1.4. The tool therefore exhibits an adequate management tool that can be used to address aspects of a complex healthcare system in order to create value.

9.5 The proposed framework and management tool

The proposed management tool consists of three overarching dimensions that each have their own canvases as illustrated in Figure 9.2. The figure presents a complete overview of the final management tool. The first two dimensions, namely the pre-use canvas and the tool guideline, consist of canvases used prior to the use of the ecosystem canvas. The first dimension, which is the pre-use canvas, helps to define the healthcare system and its stakeholders by highlighting the requirements and considerations that need to be noted prior to the use of the tool. Dimension two forms the tool guideline which gives an overview of the development parts of the ecosystem canvas. These development parts were formulated with the South African healthcare context in mind. The final dimension forms the ecosystem canvas which represents the process of value creation in the healthcare context. This canvas is accompanied by an additional conceptual canvas which provides the descriptions or implications of each of the framework's concepts to complete it.

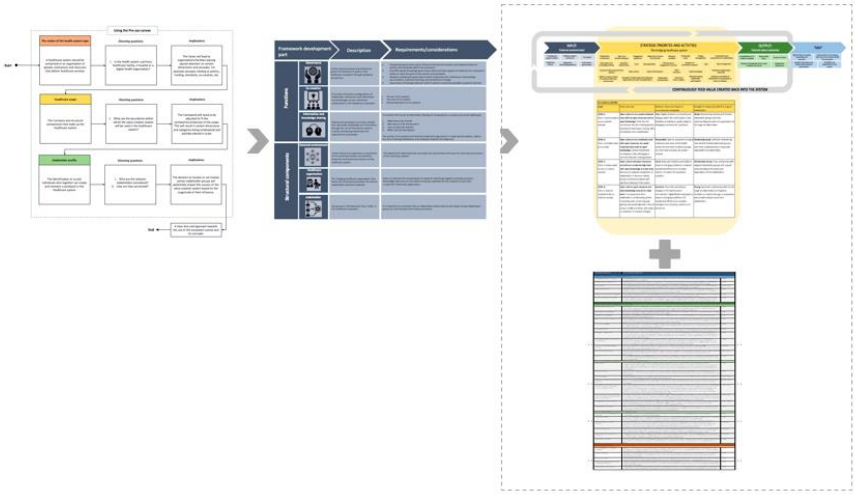


Figure 9.2: Overview of framework and management tool structure

The dimensions and their canvases characterise important strategic features of a value creation system that need to be considered in a healthcare ecosystem. These dimensions are intended to assist researchers, policymakers, and health care workers to understand how a value creation system, that is supported by information systems, can be used to address and possibly overcome challenges faced within a healthcare organisation. The final dimensions and their canvases are discussed in the sections that follow and are presented in a legible size at the end of the chapter.

9.5.1 Dimension one: The pre-use canvas

Healthcare is not an activity that has one type of action, which is why setting a perspective to narrow the scope is important. Throughout the process of evaluating the framework, the researcher realised the importance of clearly defining the healthcare profile as it greatly influences the lens used to view the framework. The Pre-use canvas, presented in Figure 9.3, therefore highlights this importance of establishing the healthcare profile. Here, the notion of the healthcare system, healthcare scope and stakeholder profile are the three factors comprising the healthcare profile that were found to influence the approach towards the framework. These factors need to be established prior to the use of the framework.

There is value in starting the value creation process with a clearly defined healthcare profile. This is important as there are implications that need to be considered for each of the components comprising the healthcare profile when using the framework. The notion of the healthcare system type is used to establish whether the healthcare system is a primary healthcare facility, hospital or digital health organisation. The framework was developed to be as generalised as possible, thereby allowing it to be utilised in these varying healthcare system types. Defining the healthcare system type is important as it results in emphasis being placed on certain framework items. The healthcare scope forms the second component used to define the healthcare profile. Here, scope of the healthcare system under which the framework is used needs to be defined. This is essential as the framework needs to be adjusted to fit the context or the circumstance of the scope which will place further emphasis on certain framework items.

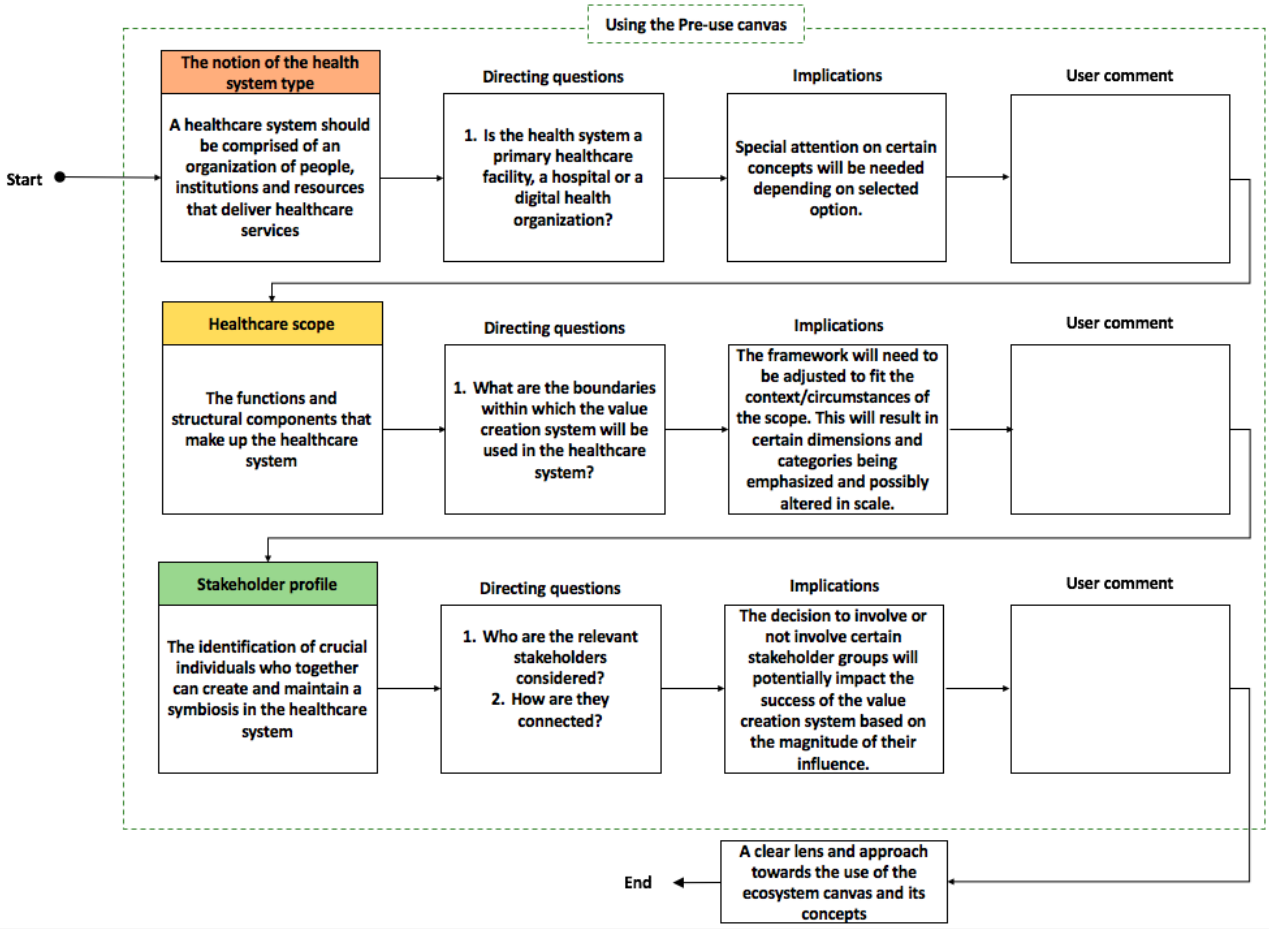


Figure 9.3: The evaluated Pre-use canvas of the management tool

Following the first two components of the healthcare profile is the consideration of the stakeholder profile. Stakeholders have the potential and ability to affect the success of a healthcare system. This is largely based on the magnitude of the influence that they have which varies from stakeholder to stakeholder. Defining the stakeholder profile is therefore necessary to determine which relevant stakeholders are considered. The range of stakeholders involved in a healthcare system forms the foundation for value creation and co-creation. Therefore, the decision to involve or not involve certain stakeholders has the potential to impact the success of the value creation system.

9.5.2 Dimension two: The tool guideline

The second dimension of the framework, presented in Figure 9.4 on the next page, is the tool guideline which has two overarching aims. The first aim of the tool guideline is to facilitate the design, development and implementation of a value creation strategy used within a healthcare system. The tool guideline aims to achieve this by guiding the user through the typical development parts that form the dynamic building blocks of a successful value creation system. The second aim of the tool guideline is to educate users by providing them with a branch of knowledge on the various development parts that form the foundation for value creation in a healthcare system. Here, the users are informed on the practical and actionable elements of a value creation system which draws from literature, interviews and case studies conducted in the research

The tool guideline which presents the six development parts of the value creation system. These development parts are: (1) governance, (2) co-creation, (3) information and knowledge sharing, (4) external environment, (5) healthcare organisation and (6) stakeholder. These development parts form the functions and structural components of the value creation system and are grouped accordingly. Governance, co-creation, and information and knowledge sharing are classified as the functions of the value creation system. The remaining development parts, namely the external environment, healthcare organisation and the stakeholder are classified as the structural components of the value creation system.

Governance forms the first development part classified as a function of the value creation system. Governance refers to the actions and rules used to govern the healthcare system and takes into account the people and the organisation's decision making processes. In this way, governance influences how the ecosystem functions and is therefore key for the success of the healthcare system. The second function of the value creation system is co-creation. Co-creation elucidates the importance of fostering collaboration between healthcare system actors to facilitate a neutral space for open and iterative dialogue. Co-creation essentially allows stakeholders to learn and share knowledge between one another to attain personal and institutional capacity for the purpose of co-constructing new and innovative solutions in an efficient manner. The last development part classified as a function of the value creation system is information and knowledge sharing. This development part considers the management and use of information and knowledge to support healthcare processes in creating value. Here, the 'what', 'who', 'how', and 'when' information should be shared is considered. Sharing information and knowledge encourages co-creation, and by facilitating the sharing of information, through governance and standards, the care that people receive improves.

Framework development part		Description	Requirements/considerations
Functions	Governance	Used to exercise power and authority to govern the behavior of actors in the healthcare ecosystem through standards and policies.	1. Hierarchical governance which influence that the formulation and implementation of policies and standards within the ecosystem 2. Scientific-based knowledge governance which provides support to maximize the ecosystems ability to reach the goals of the policies and standards 3. Adaptive collaborative governance which emphasizes the importance of knowledge accumulation, collective learning, and sensitivity to changes
	Co-creation	A function of dynamic configurations of stakeholder connections and information and knowledge sources that foster collaboration in the healthcare ecosystem.	1. The aim of co-creation 2. The level of co-creation 3. Influencing factors of co-creation
	Information and knowledge sharing	Sharing and exchange of accurate, reliable and up-to-date knowledge and information through the use of information systems involves distributing information for organizations and people.	To enhance the results of information sharing the following four questions should be addressed: 1. What should be shared? 2. Who should it be shared with? 3. How should it be shared? 4. When should it be shared? The quality of the answers will help the healthcare organization in reducing redundancy, reduce the cost of sharing information and ultimately improve the responses.
Structural components	External environment	Factors that act as supporters or constraints of the healthcare system and therefore shape the environmental structure of the healthcare system.	The explicit and implicit political, economic and social factors that span the external environment of the healthcare system.
	Healthcare organization	The 'bridging healthcare organization' that forms the intermediary between the diverse stakeholders and their networks.	Needs to facilitate the development of networks that brings together multiple positions, knowledge types and sources while providing a platform for the creation of value that sustains the healthcare organization.
	stakeholder	Any group or individual who has a 'stake' in the healthcare ecosystem	It is important to remember that no stakeholder stands alone as the stakes of each stakeholder group are multi-faceted and innately connected

Figure 9.4: The evaluated tool guideline of the management tool

The external environment forms the first development part classified as a structural component of the value creation system. The external environment refers to the external influences that shape the strategic behavior of a healthcare system. These influences form the pre-existing conditions that either hinder or provide new opportunities to create value. For this reason, the external environment plays a vital role in the structure of the healthcare system. The healthcare organisation forms the second structural component of the value creation system. The healthcare organisation is recognised as a key feature that is necessary to foster a collaborative environment between diverse stakeholders within their networks. In this sense the healthcare organisation forms an intermediary between these stakeholders which encourages co-creation and therefore value creation. The final structural component of the value creation system is the stakeholder development part. This structural component refers to the group of individuals whose 'stake' and influence has a great impact on the success of the value creation system. Stakeholders play an important role in the healthcare ecosystem as they shape the ecosystem by continuously acting and reacting to environmental changes and pressures that arise as a result of other stakeholders and additional influencing factors.

The structural components together with the previously discussed functions are arranged to form Dimension three of the management tool discussed in the following section. It is important to note that the governance, information and knowledge sharing, and stakeholder development parts were not designed to stand alone in Dimension three due to their significance in multiple framework items. The elements of these development parts were therefore integrated into one or more of the framework's items as supporters/influences of the respective concepts.

9.5.3 Dimension three: The ecosystem canvas

The initial management tool was originally designed as a standalone framework consisting of three ecosystem levels initially identified from the scoping review in Section 3.4. These levels were referred to as the units of analysis that formed the entities studied in each of the ecosystems at that stage. In Chapter 3, these entities were referred to as the political and economic environment, the organisation and the actors. The political and economic environment referred to factors such as politics, economics and social instabilities that influence the structure and performance of the organisation. The organisation, at that stage, was referred to as a system designed to provide an infrastructure and resources to support the interaction and service transaction between actors. Lastly, the actors were referred to as the interconnected agents whose attributes determine the success of the organisation. These results from the scoping review further developed in Chapter 5 and were used to form the ecosystem levels of the preliminary conceptual framework.

Following the insight gained from the evaluation process which focused on the South African healthcare context, the ecosystem levels of the framework were modified and refined. Furthermore, the original management tool was transformed into a final three-dimensional framework consisting of canvases specific to the South African healthcare context. The ecosystem canvas, discussed in this section, forms part of Dimension three and includes the newly termed ecosystem levels which are the external environment, the organisation and the stakeholders. These ecosystem levels form subcategories to three categories, namely the input, strategic priorities and activities, and the output. These categories and subcategories are discussed in detail in the sections to follow.

The layout of the Ecosystem Canvas is presented in Figure 9.5. The ecosystem canvas is firstly presented in the format of a feedback loop to illustrate the structure of the value creation system. This structure consists of the most notable concepts from literature that need to be considered when creating value centered around information systems in a healthcare ecosystem. This part of the ecosystem canvas is structured in this manner to encourage and support the continuous growth, development and improvement of a healthcare system. The concepts included in the ecosystem canvas and their respective descriptions/implications form the second part of ecosystem canvas. The second part of the ecosystem canvas is presented in Table 9.3 at the end of this section following the discussion of each of the categories of Dimension three.

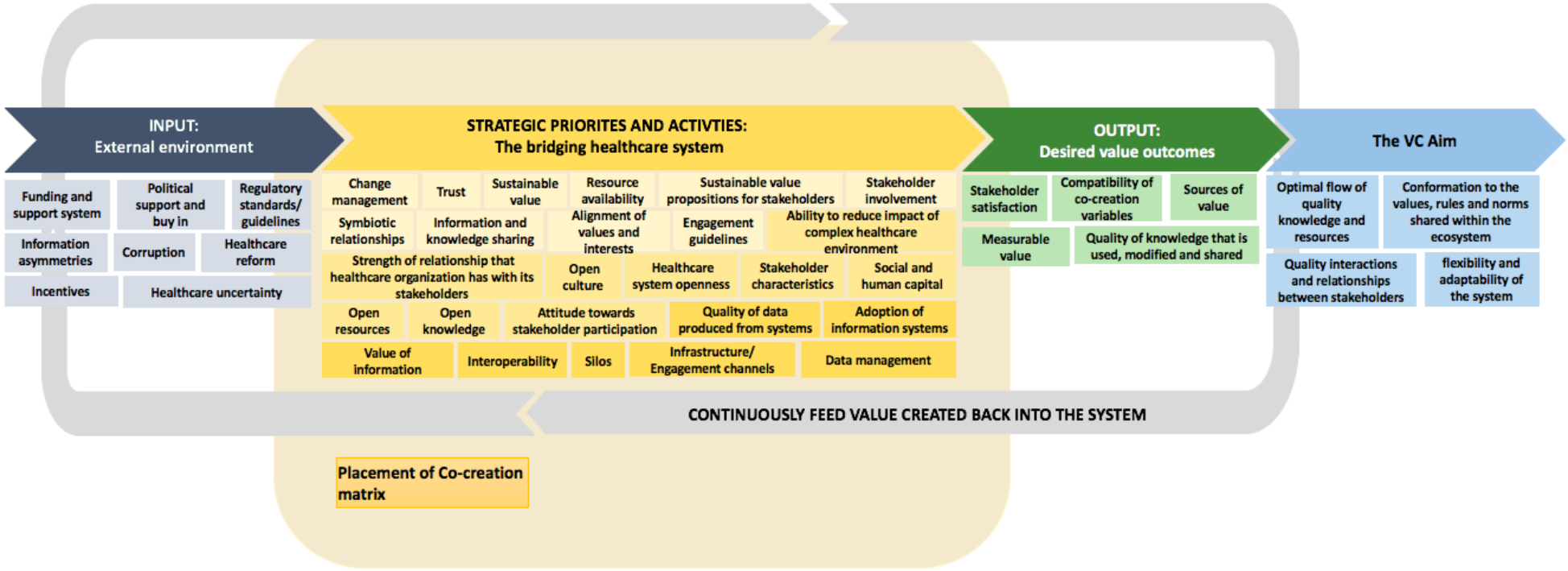


Figure 9.5: The evaluated structure of the ecosystem canvas

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Table 9.2: The evaluated co-creation matrix

Co-creation activity			
Level of co-creation	**Healthcare facility openness**	**Ability to reduce the impact of environmental complexity**	**Strength of relationship with full range of stakeholders**
LEVEL 1:	**Open culture is at a weak-moderate level with no open resources and no open knowledge:** The facility has full control over decision making process, low level of information sharing, little contribution from stakeholders	**Poor:** Highly sensitive to environmental changes within the health system, little flexibility and ability to quickly adapt to changing environmental conditions	**Weak:** Relationships formed with limited stakeholder groups with little understanding of needs and expectations of full range of stakeholders
LEVEL 2:	**Open culture is at a moderate level with open resources at a weak moderate level with no open knowledge:** Limited stakeholder contribution, the facility still largely in control of decision making process	**Reasonable:** Slow to respond to changing conditions and needs of the health system environment, modern concepts are often built but plans are seldom realised	**Moderately weak:** sufficient relationships formed with limited stakeholder groups with some understanding of needs and expectations of stakeholders
LEVEL 3:	**Open culture and open resources are both at a moderate high level with open knowledge at a low level:** Narrow and targeted cooperation of stakeholders in decision making process, limited boundaries with significant sharing of information	**Good:** Adequate flexibility and ability to adapt to changing conditions, moderate operational efficiency to translate modern concepts into actualised activities	**Moderately strong:** Close relationship with targeted stakeholder groups with a good understanding of the needs and expectations of the stakeholders
LEVEL 4:	**Open culture, open resources and open knowledge are all at a high level:** Full cooperation from stakeholders, collaborating parties completely open to learning and gaining new knowledge that is free to access, modify and share, and using it to implement innovative changes.	**Excellent:** Very little sensitivity to changes in the health system environment, highly flexible and quick to adapt to changing conditions, full operational efficiency to translate strategies into processes, systems and structures	**Strong:** Symbiotic relationships with the full range of stakeholders are forged to facilitate co-creation through co-specialized and complementary inputs from stakeholders

9.5.3.1 The input category

In a healthcare ecosystem, the healthcare organisation (which includes healthcare facilities for the sake of this explanation) does not stand alone. It consists of a network of explicit and implicit relationships that span both the internal and external environment. It is for this reason that the ecosystem canvas suggests the consideration of not only the internal factors of the organisation but also its external influences. This is motivated by the need to gain a deeper understanding of the influence that these environmental factors have on the organisation's desired outcomes and to stimulate innovativeness within the healthcare organisation. The healthcare organisation relies on and is greatly influenced by changes that exist within its external environment. These external influences govern the healthcare ecosystem and therefore shapes the structure of the healthcare organisation. It is for this reason that the external environment is considered to be an input that drives the strategic behavior of a healthcare system, hence its placement in the input category of the ecosystem canvas. The most notable external influences from literature are included in the input category. These influences should be considered as constraints or enablers of the healthcare systems ability to reach the desired healthcare outcomes. The input category recommends users of canvas to consider the external influences shown in Figure 9.6, which span the healthcare organisation's external environment, in order to make informed decisions.

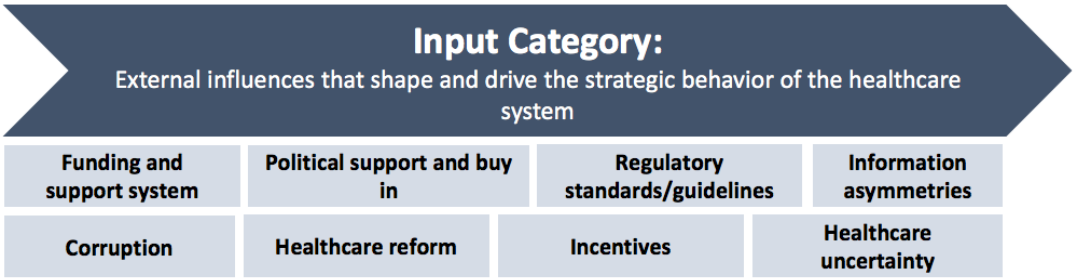

Figure 9.6: Recommended external influences consider

These external influences have an important role on the complexity of the healthcare system as the external environment is dynamic in nature and is continuously changing. It is therefore important to consider these influences to reduce the impact of complexity of the external environment, in order to adapt faster to changes and to make better decisions. Subsequent to understanding the key concepts of the input category, the strategic priorities and activities category follows.

9.5.3.2 The strategic priorities and activities category

Strategic priorities and activities are in place to define and redefine the way in which a healthcare system operates. This category represents concepts that were thoughtfully put together as a response to the challenges experienced within the healthcare system that affect their ability to create value. This category is designed to equip users to effectively engage and support one another during the value creation process. The focus of this category is to highlight recommended concepts to consider regarding firstly the properties of a value creating healthcare system; secondly factors influencing stakeholder involvement and co-creation success; and thirdly factors influencing information and knowledge sharing. These concepts are presented in Figure 9.7 on the next page.

The properties of a value creating healthcare system aim to provide a general understanding of how a healthcare system should function as well as what needs to be considered to cultivate a collaborative environment. This type of environment is essential for bringing together multiple stakeholders with varying stakes in the healthcare system for the purpose of jointly developing sustainable solutions, while still providing a platform for value creation. Each property in the healthcare system has a role in the value creation process of the system. Lack of attention and recognition of this role can result in the structure and initiatives of the healthcare system becoming

inadequate. It is therefore important to have a holistic view of all the parts of the system to understand the interrelatedness of the components and to gain a deeper understanding of where and how value emerges in the system. The idea is to foster learning networks in healthcare systems that encourage and support continuous improvement of practices and institutional development.

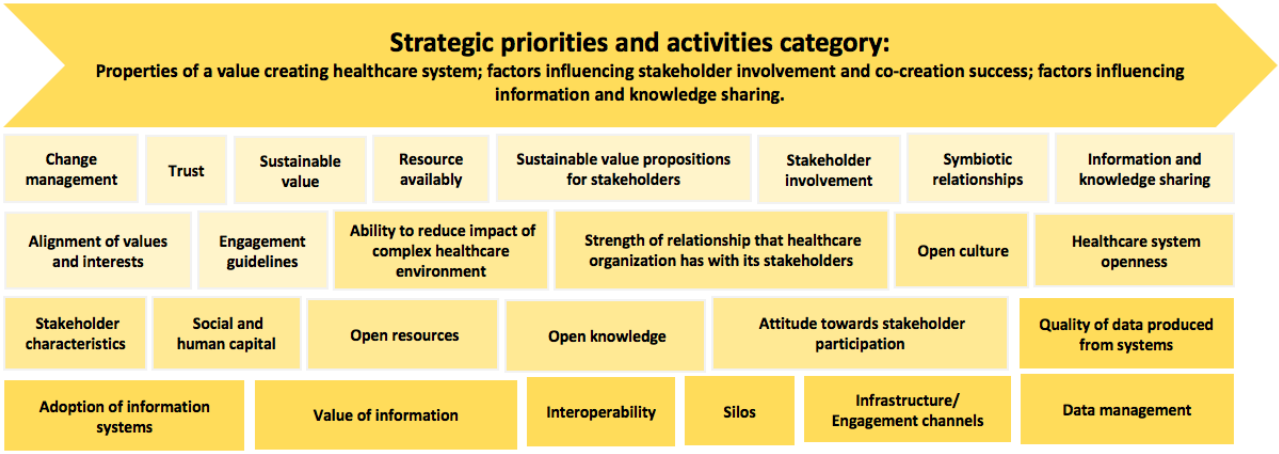

Figure 9.7: Recommended strategies and activities to consider

The healthcare system provides a space for learning and knowledge sharing, co-construction of new innovations; and is where value is essentially created. It is important for collaborative networks to exist in such a space as they play a vital role in ensuring that these objectives are met through the continuous use of co-creation practices. Deliberate implementation of these co-creation practices is necessary as the degree at which the healthcare organisation advances in its ecosystem heavily depends on these co-creation practices. In addition, these practices are necessary to have a competitive advantage and to drive innovation. A key enabler of co-creation is stakeholder involvement as co-creation is a function of the interactions between them. Exploring co-creation through the engagement of multiple stakeholder groups is essential for the improvement of healthcare services. Successful co-creation therefore requires stakeholders to be able to interact and build strong relationships with another through the exchange and integration of resources in the healthcare system. In the ecosystem canvas, focus is placed on the factors that influence stakeholder involvement as they directly affect the co-creation success. These factors can be viewed as either hinderers of the process or supporters of it. These factors are notable factors that were identified from literature, interviews and case studies conducted which were considered to be important to the context.

Information and knowledge sharing through the use of information systems is another prominent concept in the ecosystem canvas. This is because information and knowledge sharing is essential for the survival of a healthcare organisation within its ecosystem. Lack of information and knowledge sharing can potentially be detrimental and possibly affect the success of the healthcare system. It is therefore necessary to encourage transparency within the healthcare system where free and unrestricted information and knowledge is available for use by relevant stakeholders. The successful adoption and implementation of information systems play a larger role here. In the healthcare system, information systems have the potential to improve the quality of care received by patients and improve management of healthcare costs. Furthermore, if well directed, information systems can be used to facilitate information and knowledge sharing between stakeholders for the purpose of co-producing value for the healthcare system. Literature and interview data confirms the importance of information and knowledge sharing in the success of value creation, hence its inclusion in the ecosystem canvas. Value creation is connected to information and knowledge sharing as it streamlines the health system through the use of information systems. This ultimately results in improved communication, effective management of healthcare practices, improved

resource allocation and efficient resource flow; all of which are components that are essential for efficient service delivery. To harness value from information and knowledge in the healthcare system, the ecosystem canvas places emphasis on the components that facilitate the adoption, use and management of information and knowledge to support the healthcare processes to create value. In this way, the canvas encourages the need to understand the environment that the information system functions in to better understand how it links to the success of the healthcare system.

9.5.3.3 The output category

Through a comprehensive and holistic view of the healthcare system, profound implications that affect the results and desired outcomes can be identified. The ecosystem canvas does this by linking the preceding categories of the canvas to the output category as they directly and indirectly affect the desired value outcomes. The structure of the canvas therefore suggests that developing a deeper understanding of the two preceding categories is necessary to understand the impact that they have on the desired outcomes of the healthcare system. Understanding the desired outcomes of a value creation process is important in order to identify areas for improvement in the healthcare system as this determines the necessary activities that need to be performed by the organisation going forth. The output category recommends users of the canvas to consider the factors shown in Figure 9.8, as they compare to the operational and strategic performance of the healthcare system.

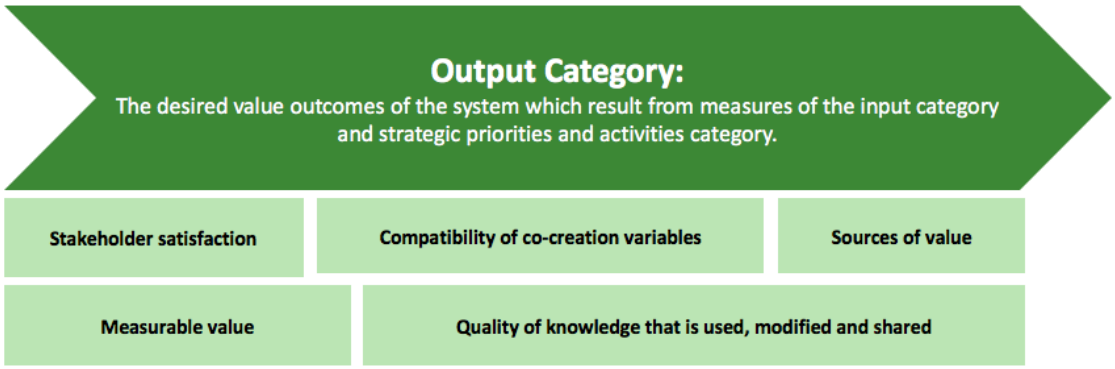

Figure 9.8: Recommended value outcomes to be consider

The value outcomes included in the ecosystem canvas are considered to be important to be achieved as they encompass many of the goals that are already considered in healthcare such as quality, patient centeredness, and cost management. The factors included in the output category were done so due to their role and significance.

9.5.3.4 The VC aim

The VC aim is included in the management tool to serve as an indicator that is intended to track the success of the healthcare system and to drive system progress. In this sense, the VC Aim can assist in optimising the performance of the healthcare system. The Aim intends to achieve this by focusing on four integrated objectives. The objectives of the VC Aim, which are presented in Figure 9.9, include ensuring: (1) optimal flow of quality knowledge and resources; (2) conformation to values, rules and norms shared within the ecosystem; (3) quality interactions and relationships between stakeholders; and (4) flexibility and adaptability of the system. These objectives are considered to be important as they recognise the fundamental principles of value creation and the role of the key stakeholders that are needed to achieve system excellence. The optimal flow of quality knowledge and resources considers how quality information and knowledge is streamlined in the healthcare system to improve communication between stakeholders, management of healthcare practices, resource allocation and efficient resource flow. These components are essential for efficient service delivery as mentioned in Section 9.5.3.2. Conformation to values, rules and norms shared within the ecosystem considers the governance mechanisms that are in place to support key actors in co-creating value in a manner that can advance the healthcare system. This is vital for the creation,

development, health, and maintenance of the healthcare ecosystem. Quality interactions and relationships between stakeholders is an essential dimension that is necessary to ensure the realisation of value creation. These interactions and relationship are expressed through the functional characteristics of each stakeholder as well as through their responsibility in the ecosystem. Flexibility and adaptability of the system refers to the the systems ability to adapt to changes or disturbances in the healthcare ecosystem. The healthcare system needs to have the ability to either return to its original state of equilibrium or adapt to a new equilibrium.

Due to the impact that the external environment has on the organisation, it was considered that its role in the value creation process could be of importance to encourage flexibility and adaptability in changing circumstances that may arise

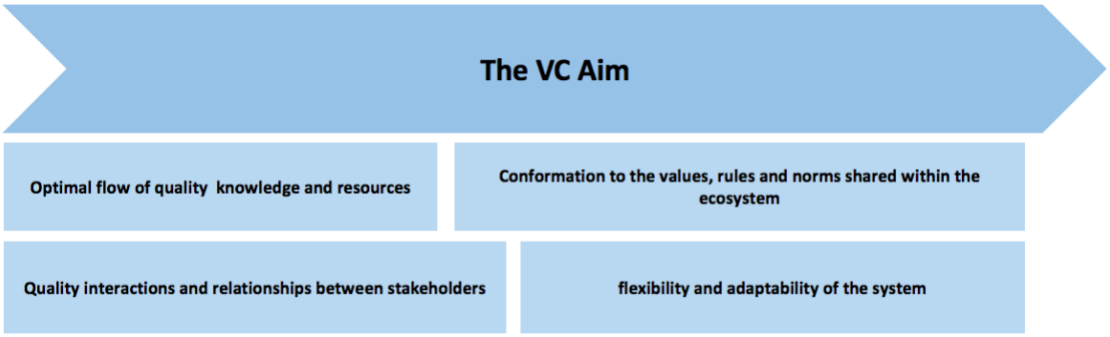

Figure 9.9: The VC Aim

The evaluated conceptual framework is presented next. This forms the second part of the ecosystem canvas. The purpose of this part is to provide the user with a better understanding of the categories and concepts that make up the ecosystem canvas. All the concepts are uniquely arranged in the ecosystem canvas which was selected as the appropriate way to convey the required information.

Table 9.3: The evaluated conceptual framework of the ecosystem canvas

Framework elements	Description/Implications
The input category:	
The external environment: influencing factors	
Funding and support system	• Funding and support to create, monitor and facilitate the implementation and realisation of proposed plans and strategies.
Political support and buy-in	• Conflict and unequal interests create great variation in social needs and actual delivery. Need to be considered and overcome to ensure adequate governmental and civil service capability. • The existence of a political-to-expertise imbalance which results from leadership positions being taken up by people with political affiliations as opposed to individuals with appropriate qualifications. • The influence of the political-to-expertise imbalance on decisions made by the government
Regulatory standards/guidelines	• Carefully drafted, science-based knowledge constructed from components which include: policies, healthcare organisations and people. • Standards are needed to direct the delivery of important services.
Information asymmetries	• Information asymmetries resulting from power asymmetries that exist between individuals occupying different network positions. • Participating parties having differing levels of knowledge and information.
Corruption	• Corruption is any form of abuse of power for personal gain. It contributes to weak governance as it affects health policy and spending priorities. • Undermines the ability to achieve various social and developmental goals.
Healthcare reform	• Changes and improvements in the healthcare system through governmental policies that affect the way in which healthcare is delivered. • Healthcare reform can be jeopardised when aspects such as poor management, poor governance, lack of accountability and unresponsiveness of the healthcare system are not properly addressed.
Incentives	• Reward structures that are put in place to promote better performance. • May be used to encourage participation with stakeholders whose interests and values may differ.
Healthcare uncertainty	• Uncertainty can negatively affect the performance and commitment of actors within the healthcare ecosystem due to the inability to gain full insight on all aspects of the ecosystem.

Framework elements	**Description/Implications**
The strategic priorities and activities category:	
Properties of a value creating healthcare system	
Change management	• Actions taken to ensure the smooth transition from the current state of the healthcare system to the desired future state. • Key steps for successful change management include: (1) assessing the readiness to change, (2) establishing a sense of urgency, (3) assembling a steering team, (4) developing an implementation plan, (5) executing the piolet, (6) disseminating change, (7) anchoring the change.
Trust	• Trust built between participating individuals from previous personal and informal interactions. • Trust levels provide insight into the state of relationships existing between different stakeholders within the collaborative network. • Necessary to sustain relationships between stakeholders.
Sustainable value	• Sustainable value creation is multifaceted involving economic, social and environmental concerns. • The creation of sustainable value involves carrying out healthcare services that sustain the healthcare system through the efficient use of resources.
Resource availability	• Necessary requisites for systems to build their value creation capacity. • Limited resources can hinder the value creation process and can be linked to low frequency of communication and interactions between stakeholders.
Sustainable value propositions for stakeholders	• The development of sustainable benefits, which can include social, economic and environmental benefits, for stakeholders. • Proactive stakeholder engagement is necessary to: (1) reduce the systems' sensitivity to emerging social, economic or environmental expectations; (2) ensure that value created for one stakeholder group doesn't result in value destroyed for other stakeholder groups; and (3) allow for the discovery of value sources and opportunities.
Stakeholder involvement	• The involvement of crucial and diverse stakeholders is essential for successful value creation. • It allows for the healthcare system to see its role and function from a larger perspective. • Diverse approaches should be used to successfully bring together different stakeholder groups based on the vision, goals and strategies of the facility/organisation. If wrongly or ineffectively used, value destruction can take place, or in the best case there may be no significant impact. • Lack of involvement of end users in the decision making process can greatly affect the value that is created. It is important to identify opportunities to involve end users.

Framework elements	**Description/Implications**
Symbiotic relationships	• Value logic is supported by the symbiotic relationship formed between participants. • It is vital to understand these interrelationships and dependencies that arise between participants to understand how value is created and delivered within the healthcare ecosystem.
Information and knowledge sharing	• More conceivable when facilitated by information systems. • Relevant stakeholders need to be willing to participate in information sharing activities. • The lack of information and knowledge sharing results in the ineffective coordination of actions and entities in the healthcare system
Alignment of values and interests	• Differing values between stakeholder groups pose a threat to the relationship between the stakeholders. • The failure to identify and properly align interests and values can severely damage the performance of the facility/organisation.
Engagement guidelines	• Engagement guidelines provide a basic structure to manage and orchestrate the way in which communication takes place between different stakeholder groups. • There must be clear principles of dialogue to guide the interactions between stakeholders. There must also be an understanding between stakeholders regarding their roles and responsibilities.
Factors influencing stakeholder involvement and co-creation success	
The ability to reduce the impact of the complexity of the health system environment	• The complexity of the health system's environment refers to the interdependent and interconnected entities that support the healthcare system. Include: stakeholders, technology systems and the facility/organisation structure. • The healthcare system needs to be able to reduce the impact of the complexity of its environment to increase the certainty of its activities and ability to exploit opportunities emerging in the environment.
The strength of the relationship that the healthcare system has with its stakeholders	• Building stronger relationships with stakeholders can reduce the impact of the complexity of the environment by reducing the sensitivity of the healthcare system to changes occurring in the environment. • It allows systems to adapt faster to the changes and possibly anticipate what's to come, in order to make better decisions through knowledge and information sharing.
Open culture	• Open culture means that a healthcare system should: (1) be open to its environment, (2) promote cooperation in its environment, (3) be open to new knowledge and changes, and (3) ensure the free formation of relationships with all relevant stakeholders. • Stimulates value co-creation in the system. • It is the backbone of a healthcare system and plays a strategic role in how a healthcare system adapts to changes.

Framework elements	**Description/Implications**
Healthcare system openness	• Actions within the healthcare system that open the system up to its environment. These actions are rooted in on open culture, open resources and open knowledge. • Requires transparency, access to knowledge and information, and collaboration is vital.
Stakeholder characteristics	• Influence whether or not stakeholders are willing to participate and co-create. • Intrinsic factors such as culture, values, level of education and language barriers affect a stakeholder's willingness to participate.
Social and human capital	• Necessary for sustainable involvement of individuals with differing levels of marginalisation and access to health services. • Relationships with these individuals are not homogeneous and can differ based on the characteristics and context of the individual.
Open resources	• Basic factors that determine the healthcare system's success in the age of complex environments. • Encourages the network of resources and the integration of activity.
Open knowledge	• Results from the solid foundation that open culture and open resources builds. • Occurs when everyone has free access to knowledge to be able to use it, modify it and share it.
Attitude towards stakeholder participation	• Attitudes of healthcare officials on stakeholder involvement affects and influences the extent to which co-creation occurs.
Factors influencing information and knowledge sharing	
Quality of data produced from systems	• Drives improvement of data quality which is essential to provide better healthcare services. • Correct, reliable and up-to-date data is critical. Its benefits include: (1) high quality care, (2) ensuring that legal requirements and professional standards are met, and (3) supporting strategic planning and management of health and social services.
Adoption of information systems	• Influenced by factors which include: (1) attributes such as the perceived usefulness of the information system compared to its perceived ease of use, complexity and quality; (2) characteristics of the healthcare individuals adopting the innovation; (3) contextual factors such as top management support and social norms; and (4) task characteristics such as difficulty and newness
Value of information	• Information is a carrier of value which increases the more it is used and shared (i.e. value-in-use, value-in-exchange). • Value of information increases even more when it is accurate, reliable and up-to-date.
Interoperability	• Interoperability allows for meaningful and effective use of information that is exchanged across platforms. • Encourages data quality and consistency.

	• Full potential of interoperability may be realised through user's (i.e. healthcare workers) acceptance and adoption of information systems.
Framework elements	**Description/Implications**
Silos	• Prevent users from obtaining certain information and knowledge • Restricts information and knowledge sharing which affects collaboration amongst stakeholders and decision making.
Infrastructure/Engagement channels	• Technical infrastructures and decision support architectures that support various applications for the creation of value and improvement of operational efficiency.
Data management	• Collecting, storing, analysing and distributing data using a set of effective and well-designed data procedures and structures. • Essential for strategic initiatives such as: (1) improving strategic decision making, (2) facilitating the integration of stakeholders and (3) identifying new value opportunities.
The output category:	
Desired value outcomes	
Stakeholder satisfaction	• Influences sustainable growth and success of the healthcare system. • A healthcare system's relationship with its stakeholders is important to assure the satisfaction of all relevant stakeholders.
Compatibility of co-creation variables	• Value co-creation is driven by the relationships between participants, the environment and the healthcare facility itself. These variables need to be compatible to successfully co-create value.
Sources of value	• Necessary to understand the value logic in the ecosystem and how value is and can be co-created in the ecosystem. Sources of value include innovation, flexibility and efficiency
Measured value	• The value created within the system is a measure of the success of the value creation system and can also serve as an indicator of the success of value co-creation in the system. • Aids in identifying areas within the healthcare system that need further improvement
Quality of knowledge that is used, modified and shared	• Using, modifying and sharing quality knowledge accelerates innovation within the ecosystem. • Quality knowledge is a necessary outcome of value creation as it allows for disparate elements of knowledge to be identified and used in cohesive ways.

9.6 Using the tool

The management tool was developed with the intention of providing a course of action that can be followed to create value through the use of information systems within a healthcare ecosystem. The purpose of this section is to discuss how the tool was designed to fit into the South African healthcare context. This is then followed by a discussion of important aspects that need to be considered when implementing the framework.

9.6.1 Consideration of the South African healthcare ecosystem

The conceptual framework that was formulated in Chapter 5 was developed from multiple sources that did not have an explicit focus on health or the South African context. This presented the need to adapt the framework to fit the South African healthcare context to achieve the objectives of the research. The various adaptations that were made took place during the evaluation process. Therefore, the consideration of the South African and/or the healthcare context was made in all three of the tools dimensions. The first dimension of tool was added as a result of insight that was gained during the evaluation process. The dimension is designed to probe users to define the context of their healthcare system which is necessary to determine the lens and approach to use when implementing the framework. The dimension consists of directing questions and respective implications which were developed with the South African healthcare context in mind. Dimension two of the framework was also an additional dimension which was added during the evaluation process. The development parts of the dimension comprise of explicit components that are necessary to successfully create value in the South African healthcare context. This includes practical and actionable elements of a value creation system which were identified from literature, interview data and the industry based case study. Within the ecosystem canvas, which forms Dimension three of the tool, SA related concepts that stood out from the evaluation process were added to the canvas. The inclusion of these concepts in the canvas are intended to encourage and support South African healthcare systems to continuously grow, develop and improve.

9.6.2 Important considerations when implementing the framework

The implementation of the management tool and framework needs to occur through the activities of the healthcare system's business model which is central to the value creation process. The business model takes into account all the resources, capital and relationships in an integrated manner and turns these valuable resources into desired outputs. It is suggested that the Implementation of the management tool be done in a three-stage process managed by project management practices to ensure the appropriate knowledge, skills and resources are used to achieve the objectives. This is essential as the healthcare ecosystem is complex in nature. The three-stage process should include: 1) a planning stage, 2) an execution stage and 3) an evaluation stage. The planning stage is where healthcare organisation will need to define their goals by describing how they intend on moving from the system's current state to their vision state. The execution stage is where the implementation of the management tool should take place. The researcher suggests the use of change management tools from this point to assist in managing the launch of value creation management tool. This is essentially to minimize the impact of the change on the various stakeholder groups and the healthcare organisation. Finally, the implementation process can be evaluated to monitor the use of the management tool in the healthcare organisation and to ensure the transition to newly implemented practices is seamless. To ensure the successful implementation of the management tool and to ensure this seamless transition it is important to consider the people, processes and the culture of the healthcare organisation.

The procedure followed when using the management tool is one that is systematic where Dimension one and Dimension two of the management tool are respectively addressed prior to the use of the ecosystem canvas. When using the ecosystem canvas, the categories are addressed in a sequential order starting from the input category, followed by the strategic priorities and activities category and

finally the output category. The ecosystem canvas incorporates indicators which when used stimulate thought and to guide the value creation process. The structure of the canvas forms a feedback loop which encourages value created to be fed back into the system to drive system progress.

When using the management tool, it is important for the following to be considered:

1. The management tool provides a broad conceptualisation of value creation in healthcare. Users need to contextualise the management tool to align with the intended scope.
2. Though an ecosystem perspective was adopted, the management tool does not account for every possible aspect that is associated with value creation in the context of health information systems.
3. The management tool is one that is conceptual and therefore having a sufficient understanding of the healthcare environment prior to its use is an essential prerequisite. This is necessary in order to utilise the framework in a way that ensures that the best solutions are developed in an efficient manner.
4. Although the ecosystem canvas presents a simplistic value creation process, the value creation system takes into account multiple variables that are complex in their own right. Therefore, iteration between categories may be necessary to ensure that each is addressed comprehensively. The illustration of how and where the iteration may take place falls beyond the scope of the research. This may be further investigated in future research.
5. The management tool was not designed to predict an outcome. It was designed as a conceptual framework with the intention of only improving our understanding of the phenomena in question. The use of the tool serves to inform the user's interpretation of the phenomena in a specific context.

Chapter 9 conclusion

Chapter 9 presented the final management tool for value creation supported by information systems in a healthcare ecosystem. A concise discussion of the motivation and purpose of the framework was given at the start of the chapter. This was followed by a summary of the methodology followed to develop the framework. Thereafter, the proposed framework and management tool was discussed in detail. The chapter concludes with a discussion of how to use the tool. Included in this discussion were some important considerations of the tool within the South African healthcare ecosystem context, and considerations for the tools used in practice.

Chapter 10: Conclusion and recommendations

10.1 Introduction

The research study is drawn to a close in this chapter. The chapter provides a reflection and summary on each of the four phases of the research design. The chapter then continues to present an overview of the research objectives with references relating to the research study. The contributions and limitations of the research study are then discussed. The chapter concludes with a list of recommendations of future work that could be pursued.

Chapter 10 objectives:

- Revisit and reflect on the four phases of the research
- Describe how the research objectives were realised in the study
- Elaborate on the research study's contributions
- Describe the research limitations
- Provide recommendations for future work

10.2 Research summary

The research study was conducted in four phases as discussed in Section 2.9. These four phases are revisited in the Sections 10.2.1 to 10. 2.2, with a summary and overview of the findings discussed for each phase.

10.2.1 Phase 1: Understanding the landscape of the problem and relevant literature

Phase one of the research study included defining the research problem and the research objectives, as well as formulating the scoping review. This was completed in Chapter 1 and chapter 3 respectively. Figure 10.1, illustrates the overview of Phase 1.

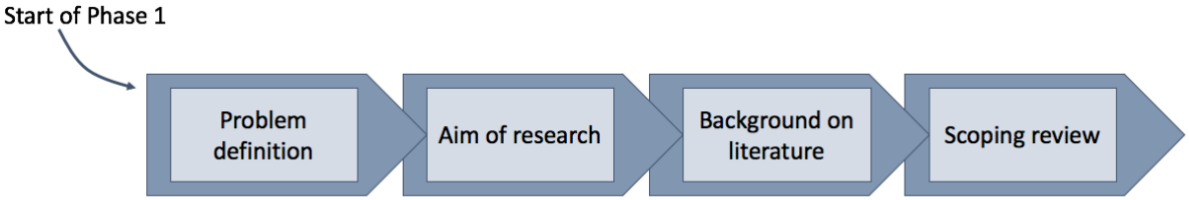

Figure 10.1: Overview of Phase 1 of the research study

Chapter 1 provided an overview of the challenges faced in current healthcare systems in South Africa, with a specific focus in the public healthcare domain. The chapter emphasizes the need to understand the healthcare system as a complex and dynamic ecosystem to gain a deeper understanding of where and how value can emerge. This led to the motivation for the exploration of various value creation and value co-creation practices that could be used in conjunction with information systems to generate value in a healthcare system. This motivation also stemmed from the need to develop innovative healthcare solutions in South Africa that ensure long lasting economic and environmental well-being. The research highlighted the potential benefits and impact that a value creation system, supported by information systems, would have in healthcare. These benefits are also evident in underdeveloped areas in South Africa.

Following the problem definition and the research motivation, the research questions and objectives were developed. This was grounded in the background of the research study. Both the research questions and objectives were intended to guide the development of the research study. The main research question was formulated into three parts, namely the main research question, sub-questions and additional sub-questions which were used to guide the formulation of the literature reviews. The research objectives were developed according to two phases. The outcomes from the

first phase of objectives included theorised concepts and a developed preliminary framework. Objectives from the second phase focused on evaluating, adapting and modifying the preliminary framework which resulted in the development of the final framework and management tool. The research design developed in Section 2.9, was formulated and followed during the development of the research study in order to meet these project objectives.

The research study followed a CFA methodology developed by Jabareen [27]. The research approach along with additional research methods, discussed in Chapter 2, were used in the various phases of the study to add depth and richness. The eight steps comprising the CFA methodology were adapted for the formulation of the study and divided into one of the four phases of the research design.

The scoping review, guided by the Arksey and O'Malley framework [43], formed a significant part in the research study. The scoping review was identified as an appropriate method to provide the researcher with an overview of the complex phenomenon under study to answer the research questions and to meet the project objectives. The aim of the scoping review was three-fold. Firstly, the aim was to identify key concepts from literature that related to value creation, information system and ecosystems. Secondly the aim was to determine the key actors highlighted in literature within the different ecosystems identified to obtain an overview of their roles. Finally, the scoping review aimed to highlight definitions and characteristics of the focus areas as well as to highlight the multidisciplinary nature of the concepts. The results from the review formed the foundation on which the remainder of the research was built and subsequently guided the development of the framework.

10.2.2 Phase 2: Formulating the framework

Phase 2 of the research study, presented in Figure 10.2, focused on using the results obtained from Phase 1 to guide the conceptual literature review and subsequent conceptual framework development.

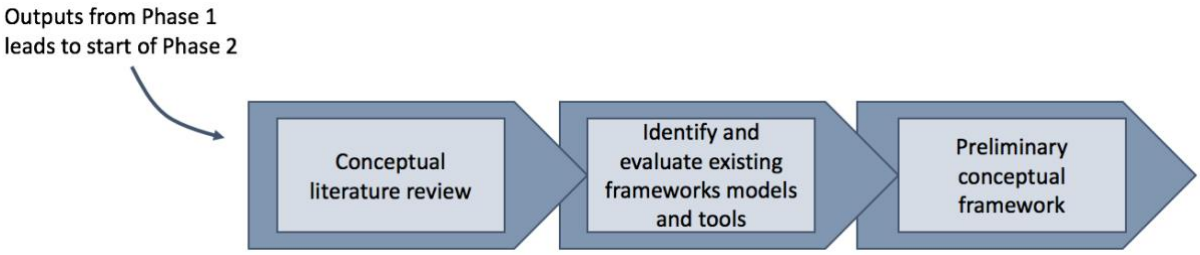

Figure 10.2: Overview of Phase 2 of the research study

The conceptual literature review provided an overview of the fundamental concepts identified in the scoping review. These concepts necessitated further investigation to gain a deeper and richer understanding of the core characteristics of ecosystems, information systems and value creation prior to the development of the framework. The review identified various types of ecosystems with the intention of gaining different learnings that could be of value and impact in healthcare and digital healthcare ecosystems. This was then followed by an investigation on information systems which highlighted the core characteristics and role of information systems within an organisation. This provided the researcher with a deeper understanding how information systems can be used to facilitate and contribute to value creation in multi-actor services processes. Following this investigation, the dynamics of value creation were explored within the boundaries of information systems and the ecosystems within which they exist. This essentially provided the researcher with a deeper understanding of the interdependent and interrelated components that form the basis for value creation within a dynamic ecosystem. The conceptual literature review concluded with an overview of existing frameworks, models and tools that were identified in literature to further inform the development of the framework. The aim was to identify an appropriate structural approach for the design, development and implementation of the value creation system.

The growing understanding of the landscape of the phenomenon obtained from the scoping review, conceptual literature review, and investigation of the frameworks, models and tools, resulted in the development of the preliminary conceptual framework. Formulating the framework involved integrating similar concepts that emerged from identified trends in the respective literature reviews and organising them into two strategic categories, namely functions and structural components. The functions category considered concepts relating to governance mechanisms, co-creation and information knowledge and sharing. The structural components category consisted of concepts relating to the external environment, organisations/institutions and stakeholders. These functions and structural components provided a holistic system-perspective that encouraged consideration of the three health system levels which include: the political and economic environment of the health system, the healthcare facility and the primary stakeholders. This resulted in a conceptual framework that took into account the people and the organisation decision making processes facilitated through the implementation of policies and standards.

10.2.3 Phase 3: Evaluation

The third phase of the research study, presented in Figure 10.3, consisted of evaluating the preliminary conceptual framework. The framework underwent a three stage evaluation process which resulted in the development of the final framework and management tool.

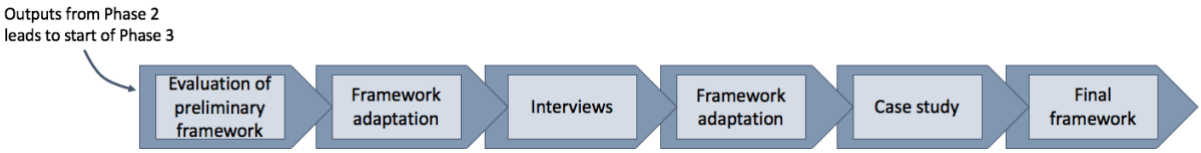

Figure 10.3: Overview of Phase 3 of the research study

The first part of the evaluation process was the preliminary evaluation of the framework. A theoretical case study focusing on Netcare's value creation initiative was used here to assess the framework against an existing value creation initiative developed within the South African healthcare context. The process involved relating themes from the value creation initiative to the preliminary conceptual framework. This helped to highlight voids in the framework which lead the most notable concepts being added to the framework. Subsequently, the researcher reconstructed the framework based on gained theoretical insight regarding the typical design, development and implementation of a successful value creation system.

The second part of the evaluation process included conducting semi-structured interviews with industry experts to gain insight from a researcher perspective, developer perspective and healthcare perspective. The interviewees that were selected were based on their expertise in value creation, ecosystem management, governance, health national standards and health information systems. The interviews were guided by an interview protocol developed by the researcher, as suggested by Creswell [31]. The protocol involved the development of research questions that were related to the full spectrum of concepts that made up the framework. This was done by using the framework's two strategic categories, functions and structural components to develop the questions. The questions were therefore related to (1) governance, (2) co-creation, (3) information and knowledge sharing, (4) external environment, (5) organisations/institutions and (6) stakeholders.

The data gathered from the interviews was extensively examined using three coding cycles which aimed to verify the concepts, detect patterns, categorise the data and to build theories. The first cycle focused validating the concepts included in the framework based on the perspectives and worldview of the interviewees. The hybrid cycle was incorporated to thoroughly analyse the interview data. Four analytical lenses, derived from notes highlighted in the first coding cycle, were adopted to achieve this. The four analytical lenses included: (1) health, (2) SSA, (3) governance, and (4)

stakeholder involvement. Topics and concepts that were continuously mentioned in the previous cycles were identified as trends and patterns in the final coding cycle. These were trends and patterns that were considered to be of importance in the design and development of the value creation system in the South African healthcare context. The final coding cycle resulted in refined data consisting of themes, patterns and deeper insight into the relationships and links between concepts. The outcomes from conducting the interviews along with thoroughly examining the interview data was an evaluated, and adapted modified framework. The framework was transformed from a one-dimensional framework into a three-dimensional framework consisting of canvases specific to the South African health context.

The final part of the evaluation process consisted of an industry based case study, guided by a process suggested by Tellis [181], and a framework ranking exercise. The case study was completed on a successful digital healthcare organisation, Jembi Health Systems. The case study relied on different sources which included semi-interviews, organisational notes and various online sources, to inform the three components of the case study. These components included (1) background information on organisation, (2) insight into the organisation, and (3) assessment of the usefulness of the tool. Sufficient data was obtained and was related back to the framework. Both the case study and framework ranking exercise provided an opportunity to confirm the transferability of the framework, given its development from multiple literature sources that spanned across multiple disciplines and varying developed countries. This therefore showcased the usefulness of the management tool in developing countries such as South Africa. The valuable observations from the two activities also led to the modification and refinement of the certain framework items which resulted in the adapted and modified framework. This formed the final framework and management tool.

10.2.4 Phase 4: Development of the final framework

The final phase of the research study, presented in Figure 10.4, was where the final framework and management tool was consolidated. The final tool was developed and presented at the end of Chapter 9. The final framework and management tool aims to provide a useful tool and a branch of knowledge for researchers, policymakers, and health care workers in the design, development and implementation of a value creation system enabled by information systems in a healthcare ecosystem.

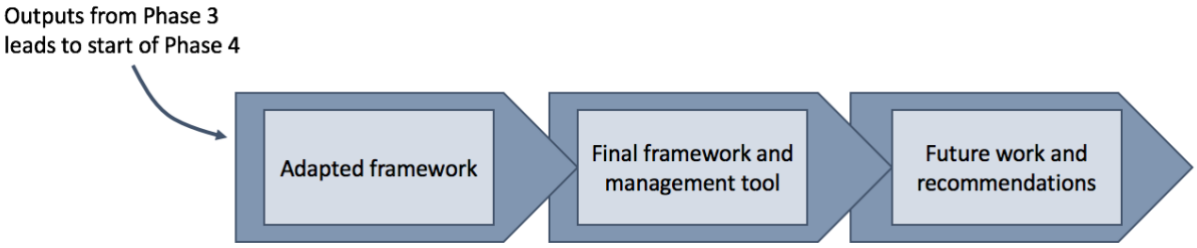

Figure 10.4: Overview of Phase 4 of the research study

10.3 Research objectives

The overarching research objective was to develop a management tool that could aid in the design, development and implementation of a value creation process within the South African healthcare context. This overarching research objective was realised through the completion of the underlying objectives presented in Table 10.1. The table highlights the activities that were performed during the development of the study to fulfill the respective objectives which in turn addressed the research questions.

Table 10.1: Reflecting on the research objectives addressed

	Research objective	Related research questions	Activity	Reference in research
Phase 1 objectives	**RO1:** Identify and examine fundamental value creation concepts from an ecosystem perspective by formulating a scoping review.	• What are the key value creation concepts considered from an ecosystem perspective? • What role do information systems have in value creation?	The scoping review fulfilled the RO1 which partiall addressed the related research questions. Here, the scoping review provided the overall picture of the research landscape which formed the foundation for the development of the study.	Chapter 3
	RO2: Establish the context and requirements for a value creation system that is supported by information systems within a complex and dynamic ecosystem by formulating a conceptual literature review.	• What are the key value creation concepts considered from an ecosystem perspective? • What role do information systems have in value creation? • What are the key defining characteristics of the ecosystem construct? • What are healthcare information systems and their key characteristics? • What role do key stakeholders, in the healthcare sector, have in the process of value creation? • What does the collaboration of these key stakeholders mean for value creation in healthcare?	The conceptual literature review fulfilled RO2 and RO3, which further addressed the research questions linked to RO1 and partially addressed the additional related questions. The conceptual literature review built on the concepts identified in the scoping review which essentially provided a deeper and richer understanding.	Chapter 4
	RO3: Explore and assess existing frameworks, models and tools that are relevant to value creation and ecosystem design and management.			
	RO4: Formulate a preliminary conceptual framework to aid in the design, development and implementation of a value creation system.	• What are the benefits of adopting an ecosystem perspective for value creation in healthcare?	The development of the preliminary conceptual framework fulfilled RO4 which partially addressed the related research question.	Chapter 5
Phase 2 objectives	**RO5:** Use an existing value creation initiative to gain an understanding of how a value creation system should function in the South African healthcare context and to modify the preliminary conceptual framework prior to evaluation in practice	• What should a value creation process supported by information systems look like in healthcare? • How can these characteristics relate to healthcare systems in developing countries?	The preliminary evaluation of the framework fulfilled RO5 which helped to partially address the related questions. A South African based value creation initiative was used to understand the components and functions that are necessary for value creation in a developing country such as South Africa.	Chapter 6
	RO6: Conduct interviews with industry experts to evaluate the content of the developed framework	• What are the benefits of adopting an ecosystem perspective for value creation in healthcare?	Gained insight from industry experts who were interviewed through a semi-structured interview	Chapter 7

	and formulate a revised and modified framework.	• What role do key stakeholders, in the healthcare sector, have in the process of value creation?	process were used to fulfill RO6 in order to further address the research questions linked to RO4 and the additional related research questions.	
	RO7: Apply the framework to an appropriate case study using real world scenarios to assess its usefulness.	• What are the benefits of adopting an ecosystem perspective for value creation in healthcare? • What role do key stakeholders, in the healthcare sector, have in the process of value creation?	A practical case study on a digital healthcare organisation and framework ranking activity lead to the fulfilment of RO7. Here, the research questions linked to RO4 and RO6 were further addressed through the knowledge gained from these activities.	Chapter 8
	RO8: Present a management tool for the design, development and implementation of a value creation system in the South African healthcare context.	• What should a value creation process supported by information systems look like in healthcare? • How can these characteristics relate to healthcare systems in developing countries?	Through the fulfilment of all the preceding research objectives RO8 was fulfilled. This also lead to research questions linked to RO5 being further addressed. Here the management tool was thoroughly discussed with specific attention given towards how the tool is related to the South African healthcare context.	Chapter 9

10.4 Research contribution

The research offers various contributions that are highlighted in this section. Some of these contributions are related to the research as a whole and others are specific to the framework and management tool.

Insight gained from the research provides a branch of knowledge to under-explored areas of research identified in Chapter 3 and Chapter 4. These areas identified relate to value, information systems and ecosystems. The research contributes to the body of knowledge relating to value creation offers insight into how digital technology can be used to facilitate and support value creation in multi-actor services processes. Information systems in particular are considered in the research. The research also contributes to the body of knowledge of stakeholder involvement and stakeholder symbiosis. The research specifically advocates for healthcare organisations to include commonly marginalised communities in their decision making processes and furthermore to develop sustainable relations with them in order to realise the goals of value creation. The research emphasizes the call for traditionally separate actors to collaborate developing solutions within a healthcare system. This is essential for the sustainable development of solutions that are of value to the users.

The next contribution of the research speaks to the ecosystem perspective used in the research. The research informs the benefits of using an ecosystem perspective to address value creation challenges. The perspective is adopted to transcend the internal view of the healthcare system. It offers a way of obtaining a holistic view of the healthcare system and its networks, relationships and mechanisms that shape it, all while still taking into account the roles and strategies within the healthcare system. In this way, the ecosystem perspective shows a variety of angles that can affect a healthcare systems ability to create value. Developing solutions to the complex problems of a

healthcare system should not fall to internal factors alone. The research shows how the actions that are external to a healthcare system have the potential to impact the healthcare system both positively and negatively. Therefore, the perspective not only offers strategies for value creation within a healthcare system but also offers a pathway for growth.

The framework and management tool conceptualises and characterises important strategic features of a value creation system from a holistic perspective. The framework comprises interdependent components that were uniquely organised in order to achieve this. The content of the framework is intended to stimulate thought and provide users with an understanding of how elements within a healthcare ecosystem can influence the value creation process. The tool offers a course of action that can be taken to create sustainable value in a healthcare system through the consideration of: (1) important input factors and external influences, (2) strategic activities that can be performed, and (3) the desired outcomes that may be achieved. The desired value outcomes highlighted in the framework, together with co-creation matrix, the VC Aim and structure of the framework are intended to inform the continuous improvement initiatives within a healthcare system in order to drive efficiencies through the use of information systems. Furthermore, the structure of the framework encourages the need to feed value created within a healthcare system back into the system in order to drive system progress.

The research study together with the framework and management tool contributes towards the transformation of healthcare delivery and provision aspect of the NHI plan. The research and the management tool offers researchers, healthcare workers and policy makers a starting point to develop institutional arrangements for quality healthcare delivery through the support of dynamic and connected societies; (2) favorable management of ICTs and (3) healthcare reinforcement.

The different tool dimensions also offer contributions. These are summarised in Table 10.2.

Table 10.2: Contribution(s) that the tool offers

Tool dimension	**Possible contribution(s)**
Pre-use canvas	• Highlights the importance of establishing the notion of a healthcare system, the problem scope and identifying relevant stakeholders prior to the use the use of a management tool for value creation
Tool guideline	• Presents the functions and structural components of a management tool for value creation
Input category	• Highlights notable influences that shape the healthcare landscape and therefore the value creation process of a healthcare system • Presents the implication of the external influences as constraints or enablers of the healthcare systems ability to reach the desired healthcare outcomes.
Strategic priorities and activities category	• Presents the properties of a value creating healthcare system • Offers notable variables that affect stakeholder involvement and co-creation success • Provides factors influencing information and knowledge sharing within a healthcare system • Drives the progression of the value creation system
Output category	• Highlights the importance of developing a deeper understanding of a healthcare system's external influences and internal operations to understand the impact that they have on the desired outcomes. • Drives the progression of the value creation system

The VC Aim	• Helps to optimise the performance of the healthcare system through the integration of objectives • Drives the progression of the value creation system
Overview of framework	• Presents a high-level conceptualisation of value creation in the complex dynamics of a healthcare system to make it more comprehensible • Offers a starting point for researchers, healthcare workers and policy makers wanting to conceptualise value creation from an ecosystem perspective within their own context • Offers uniquely organised components intended to drive efficiency and health system progress • Offers dynamic configuration of entities in the healthcare ecosystem that foster collaboration

10.5 Research study limitations

Through a critical reflection on the literature reviews, evaluation processes, and final tool the researcher identified several aspects which were learnt during the study, but were not pursued due to the study scope, these may potentially enrich further research during future research. These aspects are discussed below:

1. The scoping review was only conducted by one researcher therefore the characterisation and interpretation of the findings may have been subject to reviewer bias.
2. Only one database was used in the scoping review which limited the quantity of primary studies retrieved for analysis.
3. The semi-structured interviews were limited in the quantity of the interviews conducted. Therefore, more interviews with diverse individuals from varying disciplines could have led to better results.
4. Only one researcher analysed the interview data, therefore there may have been possible bias during the coding cycle process and use of the analytical lenses.
5. The case study on Jembi Health Systems was limited in the quantity of interviews conducted. Interviews with more employees from different departments or positions within the firm could have led to better results.
6. Jembi is an organisation that comprises multiple projects which are considered to be businesses of their own. More in-depth insight into the innovation and operational elements could have been obtained if separate case studies were conducted for each project.
7. The framework ranking exercise was limited in the quantity of individuals who participated and their respective background. More participants from varying disciplines and backgrounds could have led to better and possibly different results.
8. The interpretation of the findings from the evaluation processes depended on the researcher's understanding and therefore the interpretation could have been subject to bias.
9. The framework comprises several concepts and elements that were not investigated in-depth.
10. The framework only includes the most notable concepts from literature to comprise the input category, the strategic priorities and activities category, and the output category. The consideration of additional concepts may have an effect on the framework.
11. The framework doesn't show the relative importance and actual weight of each concept in regard to value and its creation.
12. The framework was developed to be as general as possible, it does not account for all the complex and diverse aspects of a healthcare system.
13. The framework needs to continuously evolve in order to remain usable within complex healthcare ecosystems supported by information systems.

10.6 Recommendations for future work

The final management tool, presented in Section 9.5, and the limitations from Section 10.5, were used to highlight potential research paths that can be pursued in the future. This is discussed below:

1. Due to the complex nature of the healthcare system, future work could focus on identifying more dynamic elements that influence value creation. This can also include an in-depth investigation on the actual weight and influence that these elements have on the value creation process in order to prioritise them in their order of importance. Furthermore, the complex nature of the healthcare system as well as digital trends and potential breakthroughs may require the framework to evolve in order to remain relevant.

2. Each of the main categories that make up the ecosystem canvas and the concepts that they are composed of need to be researched further. These concepts are considered to be complex within their own right as they consist of various elements that influence them. These elements therefore need to be investigated to gain a better understanding of how the concepts included in the framework hinder or support value creation. Furthermore, an in-depth investigation into the metrics of the framework, may also be valuable. The metrics of the framework include the co-creation matrix, the output category and the VC Aim placed at the end of the framework.

3. The framework presents a simplistic view of a value creation system. Iteration within and between categories may be necessary to ensure that each is addressed comprehensively. Future work can involve showing where these iterations and where they may take place. Furthermore, in-depth case studies can be used to determine the optimal amount of iterations needed to achieve the desired value outcomes. In regard to case studies, further testing and refinement of the tool as well interviewing more diverse experts would be beneficial as better results can be obtained.

4. Future work could also expand the research and compare the South African healthcare system to healthcare systems in other countries, both developing and developed. This framework could provide a blueprint for this future work where the framework could be refined and adjusted for the South African healthcare context given the additional information gained from such a comparison.

5. Due to the complex and diverse challenges faced within different healthcare systems, future work could focus on identifying and grouping commonly experienced challenges within these different healthcare systems and mapping out the most appropriate framework components that can be used to deal with such challenges. The tool was designed to merely highlight key aspects that need to be considered for value creation, adding this aspect of identifying the potential problem scope of each healthcare system type is beyond what the research intended to do.

This chapter concluded the research study and provided a reflection on the study. The chapter commenced with a summary of the research with a detailed discussion on each of the four phases of the research design. The research goals and objectives of the research study were all reached successfully and their references within the study were indicated. The chapter follows this by highlighting the contributions and limitations of the study. The chapter concludes with a list of recommendations for future work.

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Appendix A: Final Primary studies derived in scoping review

Table A.1: Primary sources from scoping review

Number	Author(s)	Paper title	Reference:
1	Osório, A Luis; Afsarmanesh, Hamideh; Camarinha-Matos, Luis M.	Open Services ecosystem supporting collaborative networks	[162]
2	Serbanati, Luca Dan; Ricci, Fabrizio L; Mercurio, Gregorio; Vasilateanu, Andrei	Steps towards a digital health ecosystem	[66]
3	Bezák, Peter; Bezáková, Magdaléna	Landscape capacity for ecosystem services provision based on expert knowledge and public Perception (case study from the north-west Slovakia)	[77]
4	Barrett, Michael; Davidson, Elizabeth; Vargo, Stephen	Service innovation in the digital age: Key contributions and future directions	[68]
5	Sim, Sarah; King, Henry; Price, Edward	The role of science in shaping sustainable business: Unilever case study	[69]
6	Abellá-garcía, Alberto; Ortiz, Marta; De-pablos-heredero, Carmen	The Ecosystem of Services Around Smart Cities: An Exploratory Analysis	[79]
7	Kharrazi, Ali; Fath, Brian D; Katzmair, Harald	Advancing empirical approaches to the concept of resilience: A critical examination of panarchy, ecological information, and statistical evidence	[78]
8	Aulkemeier, Fabian; Paramartha, Mohammad Anggasta; Iacob, Maria-eugenia; Hillegersberg, Jos	A pluggable service platform architecture for e-commerce	[70]
9	Zhang, Meng; Gable, Guy; Rai, Arun	Toward principles of construct clarity: Exploring the usefulness of facet theory in guiding conceptualisation	[74]
10	Grêt-regamey, Adrienne; Altwegg, Jürg; Sirén, Elina A; Strien, Maarten J Van; Weibel, Bettina	Landscape and Urban Planning Integrating ecosystem services into spatial planning — A spatial decision support tool	[80]
11	Adler-Milstein, Julia; Embi, Peter J; Middleton, Blackford; Sarkar, Indra Neil; Smith, Jeff	Crossing the health IT chasm: Considerations and policy recommendations to overcome current challenges and enable value-based care	[65]

12	Park, Sohyun	A preliminary study on connectivity and perceived values of community green spaces	[72]
13	Liu, Delin; Hao, Shilong	Ecosystem health assessment at county-scale using the pressure-state-response framework on the loess plateau	[71]
14	Pappas, Ilias O; Mikalef, Patrick; Giannakos, Michail; Krogstie, John; Lekakos, George	Big data and business analytics ecosystems: Paving the way towards digital transformation and sustainable societies	[67]
15	Tarafdar, Monideepa; Tanriverdi, Hüseyin	Impact of the information technology unit on information technology-embedded product innovation	[63]
16	Schiza, Eirini; Kyprianou, Theodoros; Petkov, Nicolai; Schizas, Christos;	Proposal for an eHealth Based Ecosystem Serving National Healthcare	[76]
17	Joda, Tim; Waltimo, Tuomas; Probst-Hensch, Nicole; Pauli-Magnus, Christiane; Zitzmann, Nicola	Health Data in Dentistry: An Attempt to Master the Digital Challenge	[64]
18	Heim, Irina; Kalyuzhnova, Yelena; Li, Weizi; Liu, Kecheng	Value co-creation between foreign firms and indigenous small- and medium-sized enterprises (SMEs) in Kazakhstan's oil and gas industry: The role of information technology spillovers	[73]
19	Müller, Matthias; Vorraber, Wolfgang; Slany, Wolfgang	Open principles in new business models for information systems	[75]
21	Pesce, Danilo Neirotti, Paolo Paolucci, Emilio	When culture meets digital platforms: value creation and stakeholders' alignment in big data use	[185]
22	Talmar, Madis Walrave, Bob Podoynitsyna, Ksenia S. Holmström, Jan Romme, A. Georges L.	Mapping, analyzing and designing innovation ecosystems: The Ecosystem Pie Model	[186]
23	Ferreira, Luís Miguel Menezes, João Carlos	How costumers' way of life influence the value co-creation	[187]
24	Nöjd, Sture Trischler, Jessica Westman Otterbring, Tobias Andersson, Pernille K. Wästlund, Erik	Bridging the valuescape with digital technology: A mixed methods study on customers' value creation process in the physical retail space	[188]
25	Dell'Era, Claudio Di Minin, Alberto	Value capture in open innovation processes with radical circles: A qualitative analysis of	[189]

	Ferrigno, Giulio Frattini, Federico Landoni, Paolo Verganti, Roberto	firms' collaborations with Slow Food, Memphis, and Free Software Foundation	

Appendix B: Interview discussion guidelines for semi-structured interviews

Introduction and background

- Researcher will introduce herself
- A background on the research will be presented to the interviewee using Powerpoint slides
- This will lead to the researcher discussing why the interviewee is relevant to validate the research

Permission and consent to participate

- The researcher will discuss the confidentiality and terms of engagement prior to the commencement of the interview
- Interviewee will then need to sign the consent form

Interview discussion

Introductory questions

1. With regards to the use of information systems in healthcare, that you have experience with, what is the desired aim that is to be achieved? How is value intended to emerge from the use of information systems?
2.

Establish the need for a value creation system framework

3. How important is it to create value through health information systems?
4. How many resources and effort goes into creating value in healthcare?
5. Are there standard processes, or protocols followed during the value creation processes in healthcare?
6. Are there existing frameworks or guidelines that are currently being used to create value through health information systems?
    a. If so, to what extent are they used?
    b. Do you think these frameworks or guidelines are effective in creating value in the healthcare system?

Evaluate the preliminary framework

7. What strategies are followed when creating value in healthcare through the use of information systems?
8. What should be considered in regard to the functioning of a health information system when it comes to value creation?

Various concepts from literature emerged regarding the value creation of information systems in primary healthcare. These concepts formed the building blocks that support the creation and success of the operations of a value creation system. I want to focus on these now.

9. Has X been considered during the design, development and implementation of the value creation system?
    a. If so, is it something you would regard as important?
    b. How has it been applied?
10. Please mention some ways in which X has been realized?
11. Have there been any instances when the desired goals of X may not have been realized?
12. What influence does X have in the success of the value creation system?
13. What should be considered in regard to X of the health system?
14. How can X evolve within its ecosystem?

15. Are there any concepts that you would regard as important in the context of value creation, but are often overlooked?
16. It is possible that some concepts may have been overlooked in the research study. Are there any that you would consider to be important but are not present in the framework?
17. Are there any relations between the concepts that you would deem important but have often been overlooked?
18. Are there any relationships between concepts in the framework that you would deem important that may have been overlooked in the research study?

X denotes a related concept may be inserted to complete the question.

Conclusion and thanks

1. Do you have any questions that you would like to ask regarding the research study?
2. Would you be willing to do a follow-up survey on the adjusted framework?

Thank you for your time.

Note: The summarised preliminary framework is available on the next page.

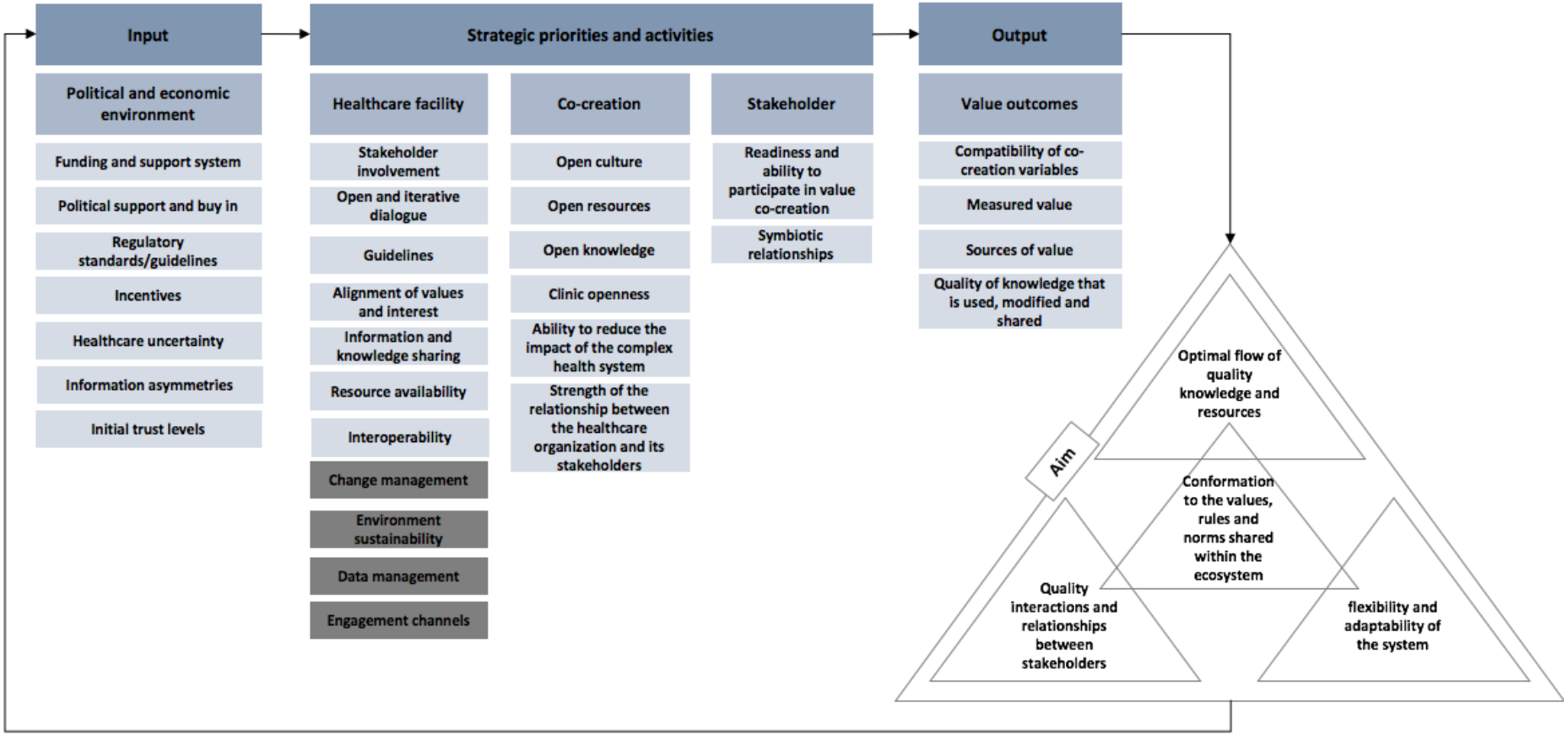


Figure B.1: Preliminary framework presented in interview

Appendix C: Framework ranking outline

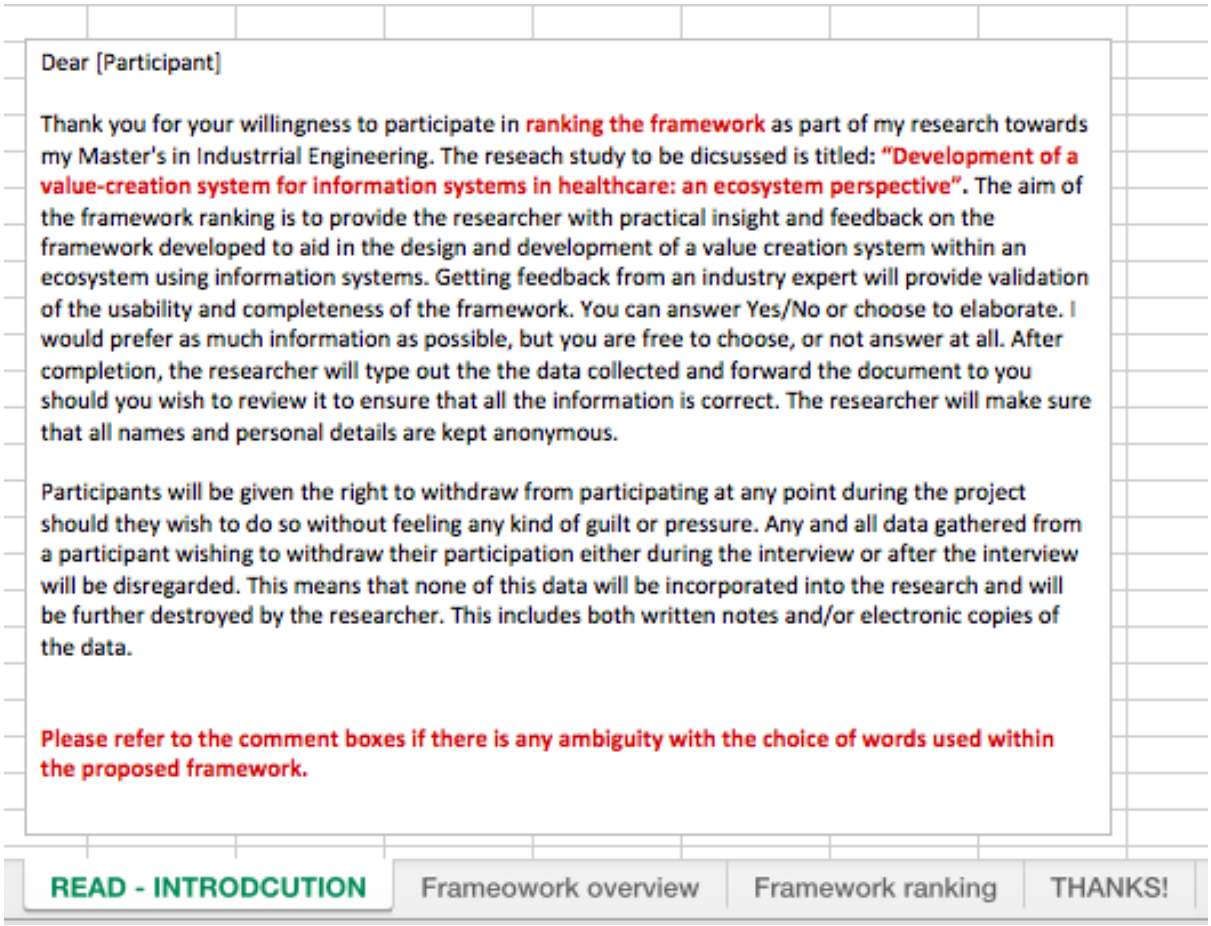


Figure C.1: Introduction to framework ranking exercise

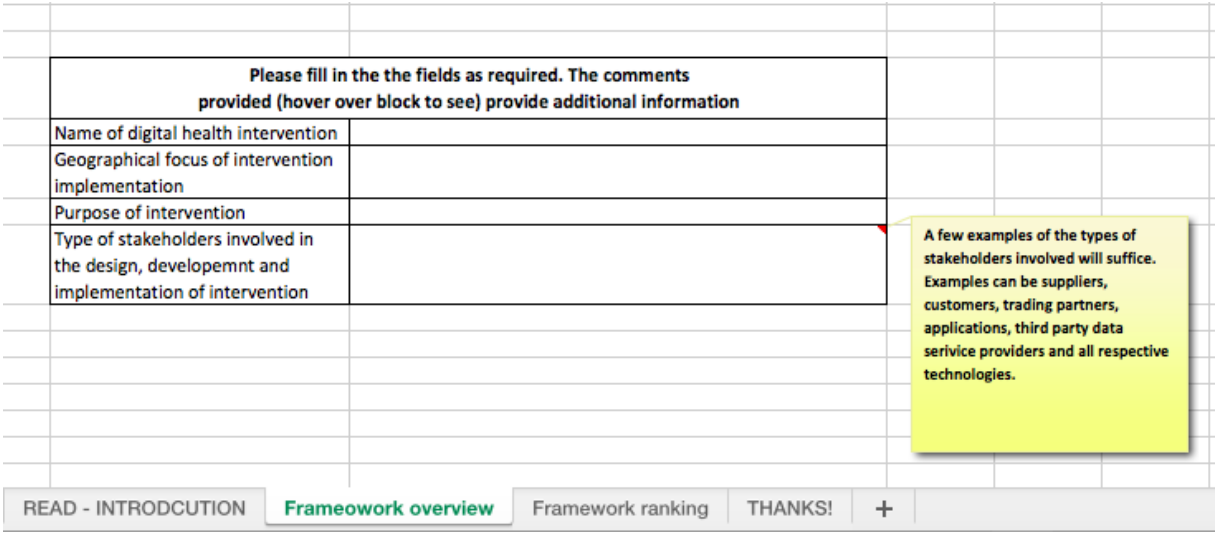


Figure C.2: Brief explanation of framework ranking process

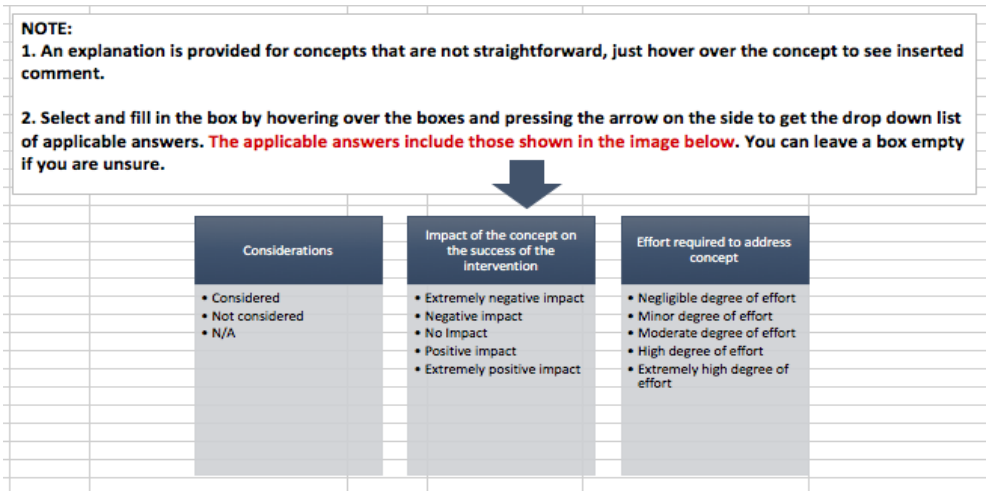
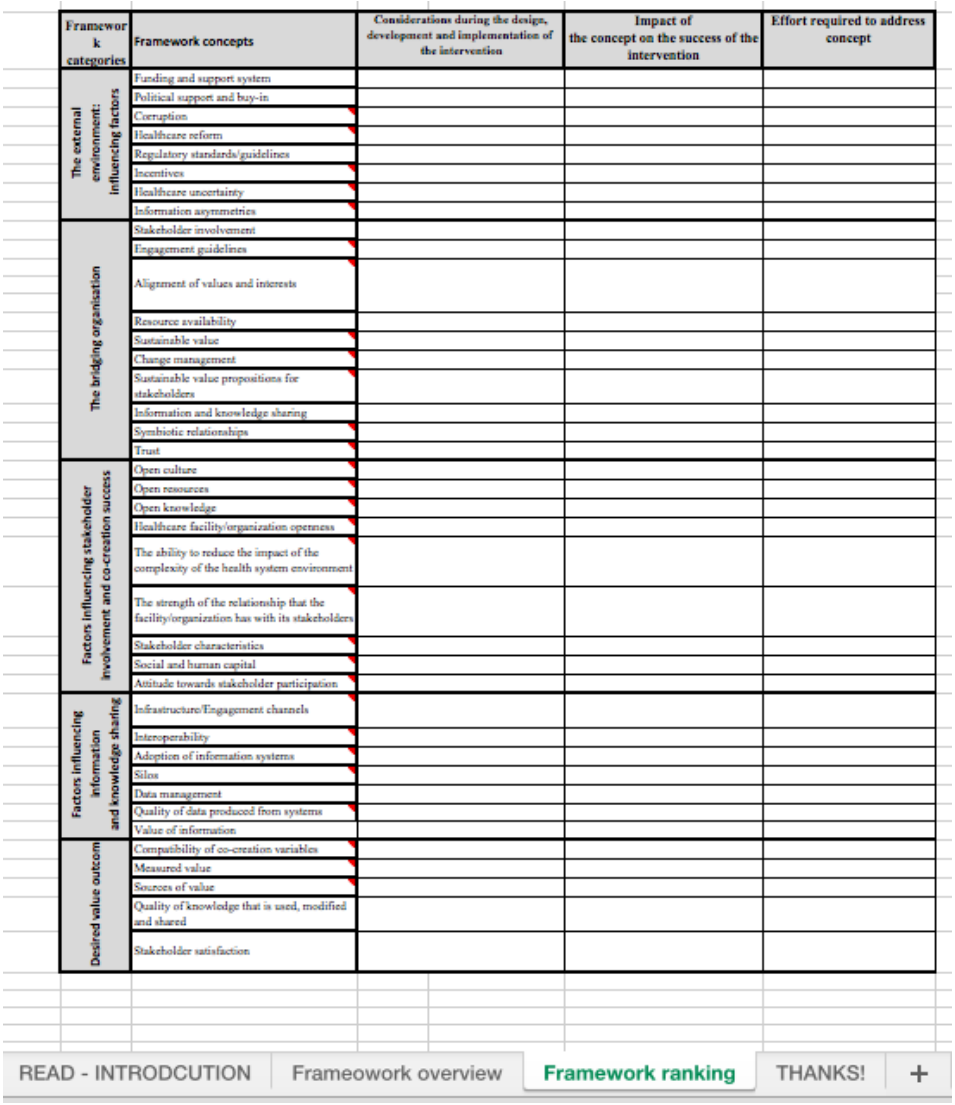


Figure C.3: Brief background on digital intervention



Framework categories	Framework concepts	Considerations during the design, development and implementation of the intervention	Impact of the concept on the success of the intervention	Effort required to address concept
The external environment: influencing factors	Funding and support system			
	Political support and buy-in			
	Corruption			
	Healthcare reform			
	Regulatory standards/guidelines			
	Incentives			
	Healthcare uncertainty			
	Information asymmetries			
The bridging organisation	Stakeholder involvement			
	Engagement guidelines			
	Alignment of values and interests			
	Resource availability			
	Sustainable value			
	Change management			
	Sustainable value propositions for stakeholders			
	Information and knowledge sharing			
	Symbiotic relationships			
	Trust			
Factors influencing stakeholder involvement and co-creation success	Open culture			
	Open resources			
	Open knowledge			
	Healthcare facility/organization openness			
	The ability to reduce the impact of the complexity of the health system environment			
	The strength of the relationship that the facility/organization has with its stakeholders			
	Stakeholder characteristics			
	Social and human capital			
	Attitude towards stakeholder participation			
Factors influencing information and knowledge sharing	Infrastructure/Engagement channels			
	Interoperability			
	Adoption of information systems			
	Silos			
	Data management			
	Quality of data produced from systems			
	Value of information			
Desired value outcom	Compatibility of co-creation variables			
	Measured value			
	Sources of value			
	Quality of knowledge that is used, modified and shared			
	Stakeholder satisfaction			

Figure C.4: The framework ranking sheet

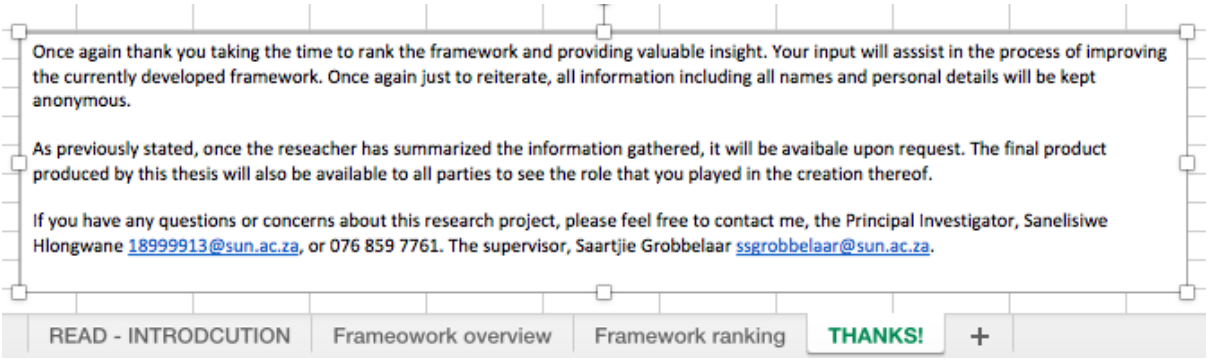


Figure C.5: Final thanks for participation